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FOOD MANUFACTURE

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FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

Volume . . . IX
Number . . . 9

SEPTEMBER . . 1934

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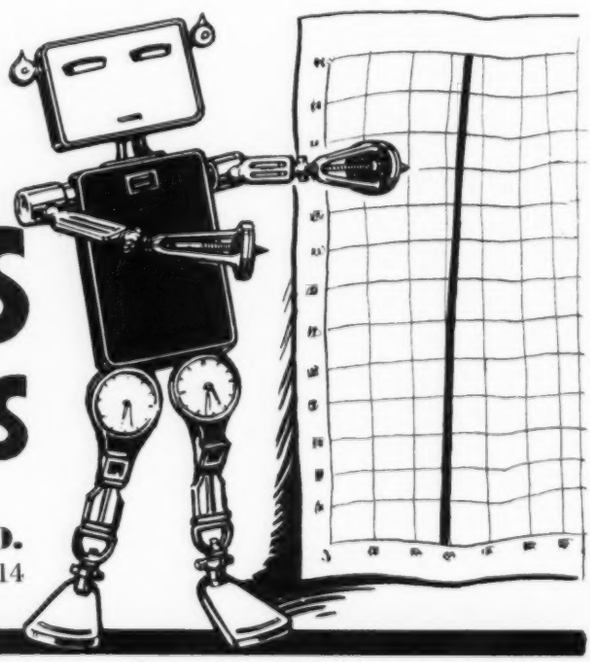

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FOOD MANUFACTURE

Vol. IX, No. 9 September, 1934

The Exhibitions

AS ONE of our contributors remarks, the Confectioners' and Bakers' Exhibitions, held in London during the first and second weeks in September respectively, offer a grand opportunity for every thinking person to learn more. Of course, it is also an opportunity to meet friends and have a good time, although this applies perhaps more to the Brewers' Exhibition than to any other.

Mr. Parker, who is a craftsman of the old school of confectioners as well as an exponent of all that can be labelled "modern", makes some very true "wise cracks" in Yorkshire style in his article on Modern Cake Decoration, published in this issue. They really apply specifically to the Bakers' and Confectioners' Exhibition, but they are applicable to exhibitions in general. For instance, it is certainly true that an exhibition enables one to profit by the mistakes of others, at no cost to himself. Readers will indeed be well advised to turn over in their minds the remarks which Mr. Parker makes on what this Exhibition has to offer to those who desire to make progress.

Better Milk

We have on more than one occasion referred to the activities of the Milk Marketing Board, and while severely critical of many of its commercial methods and bureaucratic control we are in full sympathy with its efforts to obtain a better and safer national milk supply. The Board has now decided to proceed with the preparation of the Accredited Producers' Register, as provided for in the Milk Marketing Scheme. It will come into force on January 1, 1935. Briefly the proposals are that dairy farmers should submit their herds to veterinary inspection every six months to make sure that they have not any diseased cows likely to be a danger to the milk supply and also that they obtain certificates to show that their methods of producing and handling milk are satisfactory. Samples of their milk must also be certified as bacteriologically correct. The scheme is ambitious, but it is laudable. We must have milk produced under proper safeguards against disease and dirt. It must also be available at a reasonable price. The accredited scheme seems likely to meet these requirements, but the active and earnest co-operation of all county councils is necessary to put it into proper function. One thing is certain: the scheme will require a much larger number of veterinary surgeons than are qualified at present, and this promises to be a good career for any bright young men of seventeen or eighteen who can afford the fees for their training in this extremely interesting branch of science.

What's in a Name?

When is Cheshire Cheese not Cheshire Cheese? is a question that took a good deal of answering in a case at Kingston-upon-Hull not long ago. Considering the array of expert witnesses, which included Mr. A. R. Tankard, F.I.C., Mr. S. E. Melling, F.I.C., and Mr. W. B. Mercer, the Principal of the Cheshire School of Agriculture, the prosecution did not leave any stone unturned to gain a conviction, which ultimately was obtained. The cheese in question was sold as "Cheshire Cheese", the standard for which is that it should contain not less than 45 per cent. of fat calculated on the water-free basis. This cheese, however, was deficient in fat to the extent of 11 per cent. It was stated that there was a notice on the cheese calling it "Dutch Cheshire", whatever that may mean! The Stipendiary Magistrate in imposing the maximum penalty said that he considered that traders should take expert advice as to what could be regarded as Cheshire Cheese before starting to sell the article. This practice is not confined to Dutch Cheshire. We all know about "American

Cheddar" and "Wiltshire" bacon that hails from Denmark. To say the least of it, such designations are misleading and almost amount to trading under false pretences, and any sensible trader will avoid them.

The F.I.B.

The Report of the Food Investigation Board for 1933 was issued a few days ago. With each year that passes the value of the work carried out by the Board's investigators becomes more and more appreciated by the industry and indeed by the public at large, for is not the object of these researches none other than the improvement of the food supply of the people?

No doubt there are several reasons for this increasing measure of appreciation. Although there can be no end to fundamental research, more or less academic in character, sufficient has already been done to provide a sure foundation for work of a more technical nature, possessing a more obvious bearing on practice. Moreover, the research workers themselves are rapidly gaining in confidence with accumulating knowledge and, also, experience of conditions in industry. Thus are the scientists and the men of practice being brought closer together. Not only this, but these scientists have been able to demonstrate their worth to industry by a number of remarkable discoveries, and, of course, as is to be expected of the British slow but sure tradition, these have for the most part blossomed forth during the last two years.

As an example of the fact that the Board is fully conscious of its obligations to the industry which it serves, one might instance the publication of the series of leaflets, supplied free to applicants, which deal briefly and in simple language with practical problems of the storage and transport of foodstuffs. This is one way of carrying out what is perhaps the most difficult part of the Board's task—namely, to secure the effective translation into commercial practice of the results of the research work.

Now a few brief notes on the salient features of last year's work.

Chilled Beef

One brilliant success of scientific research was scored on July 18 of last year with the arrival at Southampton from New Zealand of the first commercial consignment of chilled beef in carbon dioxide gas storage. Beef can be held in perfect condition in the chilled state for as long as 60 to 70 days in an atmosphere containing 10 to 20 per cent. of carbon dioxide.

During the year considerable progress has been made in the study of this method of storage, both in the laboratory and in experimental shipments. One related problem still awaits satisfactory solution, and that is to devise means of ensuring the necessary gas-tightness in ships' refrigerated spaces.

Fruit Storage

This problem of the construction of gas-tight storage extends also to fruit. The gas-storage of fruit, in respect of the conditions of temperature, humidity, and contents of carbon dioxide and oxygen, has been actively investigated, and important progress has been made. The difficulty here is that for each type of fruit and, indeed, for each variety of a particular fruit, there exists one set of conditions which are best adapted for its storage. This means that for each variety of each type of fruit—and, indeed, for the same variety grown in different localities—careful trials are necessary to determine the optimum conditions of storage.

Another aspect of fruit science which has received additional attention is the influence of carbon dioxide, oxygen, ozone, ethylene, and the substances given off by ripe apples, bananas, peaches and pears, on stimulating or retarding the onset of the climacteric. It has been found that oxygen is concerned in the mechanism by which ethylene promotes the onset of the climacteric—*i.e.*, shortens the life of the fruit—whereas carbon dioxide delays the occurrence of the climacteric with a corresponding lengthening of its life.

Bacon

Increased attention has been given to the storage and curing of bacon. Mild cured bacon has been stored in carbon dioxide for 18 weeks at 0° C. and was then in excellent condition. In another experiment bacon was kept in good condition for 8 months at −3° C. (26·6° F.) and at −10° C. (14° F.). Excellent bacon can be made here from pork imported from Australia and New Zealand in the frozen state.

As regards the work on curing, an account was given in last month's issue of this journal.

Fish

The report refers to the researches carried out at the Torry Research Station with the object of

enabling the home fishing industry to supply the consumer with fish of ever-improving quality.

The Station has shown, for instance, how the period over which fish can be kept in first-rate condition aboard a trawler, by the customary method of stowage in crushed ice, may be doubled —*i.e.*, increased from 5-7 to 10-12 days—while for long-distance fishing the conditions for brine-freezing and cold storing the common kinds of white fish have been fully worked out.

A start has now been made on investigations which aim at improving the smoking of herring. Another investigation concerns the production of milder salt-cured herring, since the hard cure of commerce is not suitable for the home market. It has also been found in the course of work on rapidly freezing herring for storage purposes that kippers can be made from such fish after 4 months' storage.

Continental Herrings

The Chief Inspector of Sea Fisheries, Mr. William Keir, M.B.E., has now issued his report, under the Fishery Board for Scotland, of his visit to the principal herring-consuming countries on the Continent.

The superior quality of British herrings is recognised in all Continental countries, but under present conditions cost and not quality has become the most important consideration. The British herring trade has experienced many vicissitudes, but the situation by which it is at present faced is unparalleled, and, unless markets which have been partially closed since the war years can be re-established, an arrestment of the decline in the industry appears to be all that can be hoped for. It is doubtful if even this can be accomplished unless selling prices are maintained on a more competitive level.

Egg Storage

Aside from other changes, one of the alterations suffered by eggs on storage is a decrease in the ratio of thick white to thin white. This has been found by Balls and Swenson (*Ind. Eng. Chem.*, 1934, vol. 26, p. 571) to be due to proteolysis of the thick white catalysed by a tryptic enzyme present therein. The exact nature of the change has not yet been established, but two suggestions are put forward. Either the mucin is broken down to a considerable extent or the mucin is hydrolysed only to such an extent as to give products less hydrophile in character, and liberating some of its bound water. As a tryptic ferment inhibitor is present in the thin white, the latter mechanism is considered the more probable.

Harvest

It seems but a short time since last we wrote "Harvest Home", but seed time has been again and harvest is with us once more. It has been a curious year, and one in which the effects of a prolonged summer drought following a winter very deficient in moisture are most noticeable. Many farming reports have bewailed the shortage of rain, and this has been most serious in the case of crops and pastures. Some of the root crops, however, have been saved by the rains in early August. We understand that potatoes promise well in Cambridgeshire and Cheshire, but there is always the danger of second growth when rains follow a drought. This invariably causes blight. Wheat seems to be prolific everywhere, but according to one authority in Herefordshire, although there is one of the finest shows of wheat seen for years, "it may not thresh out as well as it looks." The wheat harvest is well advanced, and we hear most promising reports from Sussex, Hampshire, and East Anglia.

Barley and Oats

Barley is doubtful. In Oxfordshire it is stated to be definitely bad, but more promising reports come from Norfolk and Suffolk. There it is confidently expected that good malting samples will be available. The yield and quality of English barley this year is of vital importance in view of the brewers' undertaking to use a bigger proportion of English barley. It would indeed be paradoxically tragic if the yield and quality were below normal. As would be expected, winter oats have done well everywhere. In Sussex some winter oats were cleared on July 19, and the land ploughed and sowed with turnips the same day, a feat not accomplished since 1893. Spring oats, however, have not done so well, and the dry summer, while suiting wheat and winter oats, has played havoc with all spring corn. We are naturally inclined to grumble at our weather, but taking everything into consideration we are a very favoured nation in that we are usually spared great extremes of climate. Our farming too is of such a varied nature that on no occasion is everything ruined, and what we lose on the swings we invariably pick up on the roundabouts.

Brucellosis

A remarkably thorough piece of research work has been carried out by Ward Giltner, of the Michigan State College Agricultural Experiment Station, on the subject of a public health problem, brucellosis. This is defined as a disease of the lower animals communicable to man by direct contact or by the ingestion of infective material, but probably never or rarely communicated from man to man. It is a disease which is spread all over the civilised world and is one that is becoming more serious.

The control of brucellosis is a problem in animal hygiene. Pending its solution from this viewpoint, man must seek protection through pasteurisation of milk, cooking of meat, and the adoption of a judicious technique with respect to the necessary contacts with animals and animal products.

Freezing Orange Juice

Shroder and Johnson, in the August issue of *Ind. and Eng. Chem.*, have given an interesting account of American practice as applied to the freezing of orange juice. For twenty years or more the food industry has been endeavouring to pack fruit juices without impairment of their natural qualities, and among the methods tried is freezing. The authors describe the commercial methods successfully used in Florida.

There are many factors to be taken into account, among which may be mentioned the following: The outer rind (flavedo) and the inner white pithy substance (albedo) must be largely eliminated from the juice and pulp, and orange oil must be kept so low as not to be objectionable. The extent to which oxygen can be removed from the juice or prevented from entering it during expression and freezing is also an important factor in determining the keeping quality of the juice. Conditions of freezing likewise affect the properties of the juice.

Factory Operations

In the Florida operations the chilled fruit is first closely graded as to size, and then placed by hand on vertical Coons citrus peelers, which remove most of the peel. The juice is passed through screens to remove coarse pulp and seeds, whose presence would impart a bitter flavour. The next step is to remove the gas from the juice by evacuation at 27 in. in metal surge tanks.

The freezing method found to be best in Florida is to run the deaërated juice into evacuated, vertical, ice-cream freezers. Here the juice is frozen to a slush and then forced out by positive nitrogen pressure into the fillers which discharge the slush into the cartons. The cartons are filled and closed, leaving scarcely any head space. They are then conveyed to a sharp freezer, where they are subjected to a temperature of about $-10°$ F. ($-23{\cdot}3°$ C.) and then stored at about $0°$ to $-10°$ F. ($-17{\cdot}8°$ to $-23{\cdot}3°$ C.).

Lye Peeling

In the preparation of grapefruit for canning, the first step after grading is to remove the peel. If not hand-peeled, the fruit is immersed in water at nearly boiling point until the outside yellow peel is loosened. After scoring, it is readily removed by hand. The fruit with the adhering yellow membrane is then placed in small woven-wire baskets, which are conveyed through a boiling 1·5 to 2 per cent. lye solution, in which it is immersed for 10 to 15 seconds. The trays of fruit are then well sprayed with water in order to remove the lye and also any loosened white membrane.

Grapefruit Canning

According to the Florida method of canning, the sections of peeled fruit are carefully separated by means of a special blunt knife from the membrane between the sections and from the seeds.

The sections are arranged in thin layers in aluminium trays from which the cans are filled by hand.

Syrup is added and then the cans of fruit and syrup are either heat-exhausted at 180° F. for 25 to 30 minutes (for No. 2 cans) and then double-seamed, or the cans are closed by a vacuum closing machine under a vacuum of 22 to 25 in.

Following this comes sterilisation, which is carried out at the relatively low temperature of 180° to 190° F. in order to avoid deterioration of flavour and texture. Where the vacuum closing method is used, the sterilising time is about 30 to 40 min. for No. 2 cans. If the heat exhaust method is used the sterilisation is done in less time. In either case it has been found that the heat treatment should be sufficient to give a minimum temperature of 165° F. at the centre of the can. Of course, the time depends on the size of the can.

Modern

CAKE DECORATION

By J. T. Parker.

"WE LIVE and learn" might be more aptly expressed "We learn as we live." We certainly *should* do so. The Bakers' and Confectioners' Exhibition, held annually during the second week in September, is a grand opportunity for every thinking person to "learn" *more*. Yet one often hears regular visitors to this exhibition say, "I come every year—there's nothing new! But I always see certain friends here, and we have a good time!" Such folk are those who think they have finished learning. They do not want to find fresh ideas, so they do not look for them. There are of necessity the same classes of exhibits, but each year we see how the newcomers tackle their exhibits. It is easy to condemn these modern efforts, in the same way that some older music lovers will condemn "Jazz" and "Crooning." "There never will be any more beautiful work, there never can be any more intricate designs, there never can be any more natural show of fruits and flowers than have been seen at the exhibition for many years." So they say. Whilst we realise that there is a certain measure of truth in this, we must not forget that "times change", and we, too, change as time goes on. We should endeavour to meet these changes in a kindly spirit, helping, by our real interest in their work, those who will one day stand in our places.

It is very interesting to hear the different remarks of a number of people who are looking at a particular exhibit at the same time. Each one sees it from a different standpoint; one notices the colour scheme, one picks out the design, one sees the detail; another will think immediately of the amount of time spent on the work. Others will praise or condemn the whole thing as it stands. A keenly interested person will see *all* these things; he will learn by his inspection. Incidentally, as a man profits by his own mistakes so will he profit by the mistakes of others, at no cost to himself! Glaring colours, unbalanced design, lack of attention to detail, and hurried work all convey to the real student a message of "Go thou and *don't* do likewise". On the other hand, an exhibit which shows artistic ability, and a design which is pleasing and effective combined with skilful workmanship, cannot fail to impress the student and spur him on to improve his own work.

The older style of cake decoration was dainty, pretty, floral, intricate, and detailed. The craftsman of to-day has before him a bolder type as his ideal. He uses a design which has some definite message or one which is geometrical in character. This latter often necessitates that quite large areas of the cake surface be left absolutely smooth and devoid of any form of ornamentation. There is no possible chance of covering up a fault. No attempt is made here to discuss the merits of either of these schemes of decoration. Each class stands alone—each is totally different from the other.

The photographs given here are intended mainly to exemplify the modern style of decoration.

"Musical" Cake

This cake would be very presentable at a musical gathering. The top of the cake consists of a "let-in" plaque. The sloping border round the plaque is divided

into three equal sections by series of graduated plain lines. The whole surface is quite smooth, the figure and words forming the only ornament. The plaque has a frame of overpiped fine lines. The three sections round the cake which correspond to the three divisions on top have a musical instrument piped in each with a four-petalled shape round it.

The bottom border slopes at the same angle as the top, and is divided into parts which are again divided. The sub-divisions are shown by the *appliqué* design of a musical instrument on a smaller scale.

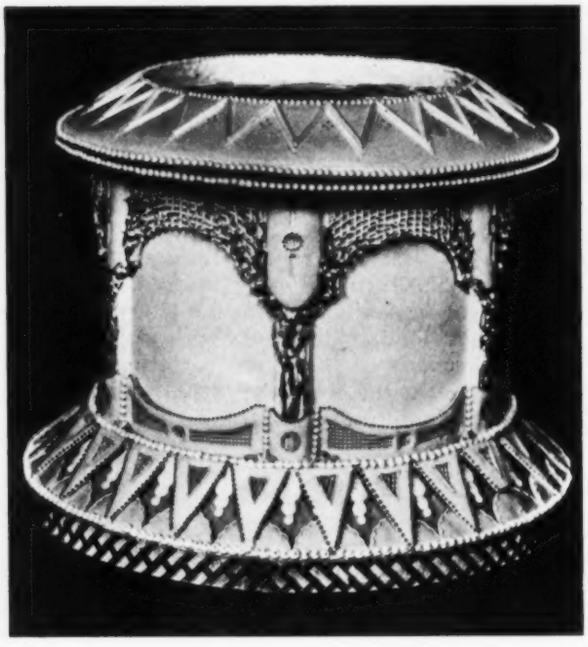
The whole of the plain surface can be a delicate mauve colour—the graduated lines a little deeper shade. The figure and instruments could be piped in delicate shades of green and mauve with touches of flesh colour where necessary, and the dress made very effective with a finely piped floral design.

"Greeting" Cake

This is another modern design with a "let-in" plaque containing a greeting. There is much more detail than on the cake described above. The design for a cake of this type must be accurately planned so that each of the *appliqué* pointed sections fits exactly in its place.

The design round the cake is made up of five trellised arches of rambler roses, with sections of *appliqué* lace-work at the base.

The colours suggested are pale pink for the base, with a little deeper shade for the pointed ornaments. The trellis and ramblers should be made to look as natural as possible.



"Hunting" Cake

This cake requires very little explanation—it is obviously for a special occasion.

The whole surface of the cake is perfectly smooth. It is covered with cream-coloured royal icing. The *appliqué* figures of huntsman, horse, hounds and fox, and also the clouds are made and coloured to look "real." The green grass of the "run" is piped very effectively at the base of the cake. The only other decoration is very fine line work with an *appliqué* border on the top and bottom edges.

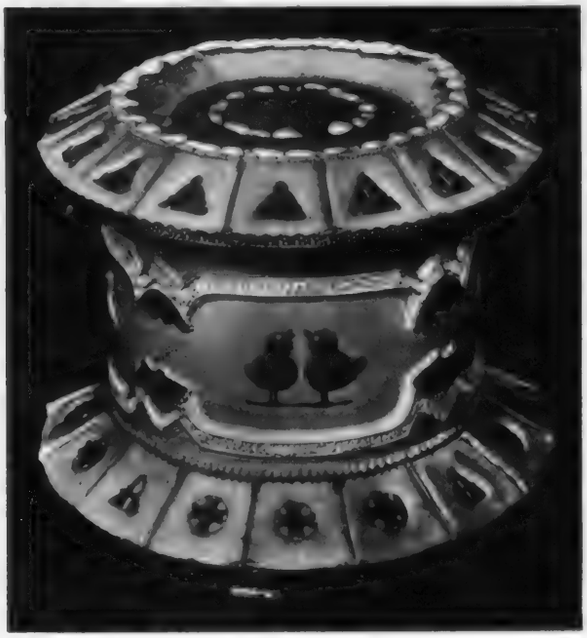
A cake of this description requires a certain amount of artistic ability combined with keen interest and pride in the work in hand.

Easter Cake

The top of this cake has a "let-in" plaque of fine lacework with a border representing broken egg shells, made of white royal icing. The inside slope is filled in with "crazy" piping, and the top edge is finished off with a border of slightly larger "broken egg shells." The top and bottom borders, which slope at the same angle, consist of a series of *appliqué* sections made to fit perfectly. The top ones have a "plumed" design let in, and those at the bottom have a design of different shaped crosses.

Round the cake are four panels which have a frame of graduated lines and "crazy" piping.

The panels are divided by *appliqué* columns made to look like broken brown egg shells. In the middle of each are two fluffy yellow "chicks."



The top and bottom borders have an edging of silver lace paper.

The base of the cake is pale yellow—the line work is orange and the "crazy" piping a delicate green colour.

The plumes and crosses are orange colour and the *appliqué* sections are outlined with orange.

Another Style

The next photograph represents another type of Easter cake. The top has an ornamental figure plaque in gum paste let in, with a sloping border containing the words "Easter Greetings" piped round it. The top and bottom outer borders are decorated with *appliqué* "shield" shapes with crosses let in. These are outlined with fine graduated line work to the outer edge. The sides of the cake are perfectly smooth—the only decoration being two *appliqué* "shield" shapes with crosses in the middle and small crosses in between each one. The outer edge of the top border consists of *appliqué* half panels.

The base of the cake is pale mauve in colour and the

line work a deeper shade of the same colour. The greeting is piped in a combination of the two shades.

Conventional Designs

The next two photographs show examples of the more usual type of cake decoration.

The first is decorated with "over-piped" scroll work for the top border, with flowers and maidenhair fern added. Star tubes are used for the large scrolls and the over-piping is done with a series of plain tubes.

The next is a similar type of cake decorated with a different border, consisting of loops and bulbs. The bulbs are piped with a finely cut star tube, and the graduated over-piping is done with a series of plain tubes. The holly leaves and greeting are seasonal.

The sides of these cakes are finished with a band of ribbon, or silver or gold lace paper edging. The bottom borders can be piped with "shell" patterns, using a finely cut star tube, or decorated with occasional sprays of flowers to match the top.

It is not desirable that the decoration of cakes should always follow the same lines. New ideas are always to be encouraged. There is unlimited scope for individuality in this branch of the profession. Quick minds, artistic ability, deft fingers, and much patience are qualities absolutely essential to the craftsman of to-day if he wishes to reach the top rung of the ladder.

The artistic craftsman should be ever alert for the reception of ideas which suggest themselves as capable of modification or direct adaptation to his own particular purposes. This means constant cultivation of one's powers of observation and imagination. The eye must be quick to seize upon some unusual or attractive feature embodied, it may be, in the design of a building or in the structure of a natural object. Here is something upon which the imagination can work; gradually a novel form shapes itself in the mind's eye; the cunning hands of the skilled craftsman set eagerly to work and, lo and behold! there emerges a masterpiece of decorative art which brings a flush of pride and pleasure to the cheeks of its creator and exclamations of delight from those who are privileged to behold it.

BAKING POWDERS

By R. S POTTER.

THE REACTION represented by the following general equation shows, in brief, the underlying principle to be considered in the manufacture of a number of food products:

$$\text{Bicarbonate or Carbonate} + \text{Acid} = \text{Carbon dioxide} + \text{Water} + \text{A Salt.}$$

Whilst in this article we are only concerned with baking powders, it is perhaps of interest to note that the same reaction is involved in several other food products, such as egg substitutes, health salts, effervescent salines, and self-raising flour. The successful manufacture of baking powder is, however, not so simple as may be supposed from the above general reaction. It is true that baking powders invariably consist of a mixture of an acid ingredient and a carbonate (or bicarbonate), together with a filling agent, but the possible variations of each of these, in chemical nature, physical condition, and amount, are almost unlimited. Moreover, correct mixing of the ingredients is essential.

The idea of baking powders, in all probability, had its origin in the old kitchen method of mixing some bicarbonate of soda with sour milk in the dough; the effect was, of course, to liberate carbon dioxide (CO_2) in the dough during baking. For convenience, solid acidic bodies such as tartaric acid or cream of tartar came to be used instead of sour milk, and gradually further alternative ingredients were suggested.

A few years ago baking powders could be classified into three main grades—the tartrate powders, the phosphate powders, and the alum powders, the CO_2-forming ingredient invariably being sodium bicarbonate, and the filling agent some variety of starch or flour. Commercial baking powder preparations usually fell into one of these three categories, or sometimes they were mixtures of two or more. In recent years the classification has become more difficult owing to the increasing use of new acids and new processes. In the years following the Great War a large number of patents have been granted relating to the manufacture of baking powders, the majority emanating from Germany. Several little-known organic acids have been proposed and many ingenious methods of "coating" the acidic ingredients have been patented.

Before passing on to a more detailed consideration of these processes and new acidic ingredients, it will probably be as well to indicate the principles involved and to show how these may be translated into practical manufacture. A good baking powder may be described as one which is capable of evolving a reasonable amount of CO_2 (12 to 15 per cent.) at the correct speed, and which does not deteriorate materially during storage. The first factor —viz., the amount of CO_2 evolved—is, of course, determined by the amount of bicarbonate (or carbonate) used, and the use of sufficient acidic ingredient to ensure practically complete neutralisation.

Speed of Gas Liberation

The means of regulation of the second factor—viz., the speed of liberation of gas—is perhaps less obvious. If the evolution of gas is too fast, large holes may appear in the loaf or other baked product, while there may be places where there is no raising effect at all. A good powder should be capable of evolving the whole of its CO_2 in the cold, of which 75 per cent. should be evolved in the first 5 minutes and the remainder in the next 15 minutes. On the other hand, powders in which the gas is evolved too slowly may be only partly effective in raising. Acording to Tillman and Guettler[1], when slow-acting baking powders which only evolve all the CO_2 at high temperatures are used, only the gas evolved in the first 25 minutes at 40° to 60° C. has any practical raising effect, since all CO_2 evolved after this blows holes in the dough which has already become solid during baking. This same effect may be demonstrated by using only sodium bicarbonate with no acidic ingredient, in which case the CO_2 is only evolved at high temperatures.

In practice the speed of evolution of gas, which has been shown above to be an important point of manufacture, is varied usually by one of three methods; but in each of these the importance of intimate and perfect mixing cannot be emphasised too much, since if mixing is not efficient and the acid and carbonate are not well coated with filling material, quick action on adding water is bound to ensue. Fortunately with modern mixing machinery intimate mixing is easily performed. Assuming, therefore, that the mixing is efficient, the manufacturer has a choice of the following methods of regulating the speed of evolution of gas, or he may combine two or more of these if desired:

(1) Varying the size of the particles of ingredients.

Filling material should always be a fine flour, and the smaller the particles the slower the reaction. In this way maize or corn starch is superior to ground rice for slowing down the reaction. When we consider the bicarbonate and the acidic ingredient, the reverse is true; the larger the crystals or particles the slower is the rate of evolution of gas, owing to the relative reacting areas of each being reduced. Most of the carbonates (or bicarbonates) used, and the acidic ingredients such as acid calcium phosphate, can now be purchased, graded to various sized particles, from the usual producers, and manufacturers of baking powders should avail themselves of such products standardised to suit their own particular requirements.

(2) Choosing acid ingredients which are only weakly acidic, such as primary calcium phosphate, in order to slow down the reaction.

(3) Choosing acid materials (*e.g.*, cream of tartar) which are less soluble than others. The reaction then obeys the ordinary laws of mass action, the velocity being reduced as the solubility of the reacting substances decreases.

It is of course the aim of every manufacturer to produce a powder which does not deteriorate in raising power during storage, and although much depends upon the conditions of storage, the manufacturer can do a great deal to help to prevent undue loss of gas.

Stability Conditions

It is important that the reacting substances—*i.e.*, the bicarbonate and acidic material—should be well coated with filling material, so that they have little chance of interaction with consequent loss of CO_2. The amount of filling material used will naturally affect the keeping quality of the powder, and it is perhaps somewhat surprising to find such a wide variation in the percentage present in commercial recipes. The filling material may be present in quantities representing anything between 10 and 50 per cent. of the total weight of the powder.

Having fixed the nature of the ingredients, the amount of filling material will depend upon the amount of available CO_2 which the powder is required to possess, and typical recipes given later will show this clearly.

The chemical nature and quality of all ingredients decided upon, the next step is to choose the best physical state. Again it may be said that the best powder for retaining its CO_2 during storage is one which contains the acidic and CO_2-forming ingredients in a fairly coarse crystalline (or granular) condition and the flour in a very fine condition. The coating effect is then at a maximum and the reacting areas are at a minimum.

The next step is mixing, and although it is fairly common practice to place the whole of the ingredients in a mixing machine at the same time, this is probably not the best method. The starch or flour should be first put in the machine, and either the acid or the carbonate (but not both) be then added and the mixer run for a suitable time—about 15 minutes—before the other ingredient is added. There is less chance of interaction if this procedure is followed. The value of the coating effect can be easily understood if a sample of the mixture is examined under the low power lens of a microscope. This coating of the reacting ingredients will be referred to later when a brief summary of some patents dealing with special methods for effecting the process are considered.

Another important point in making a stable baking powder is the choice of ingredients which are not only dry when used but which do not take up water readily from the atmosphere—*i.e.*, to choose non-hygroscopic ingredients. Further reference is made to this point later also. The addition of a small amount of an iron salt (2 to 3 per cent.) to phosphate powders has been claimed by Fiske[2] to improve the keeping quality, the iron being incorporated in the phosphoric acid from which the phosphate is made.

Recent Patents

Many patents relating to the manufacture of baking powders have centred round some process of coating the acidic ingredient.

In 1930, McCollum and Rask[3] patented a process for vacuum drying, and subsequently grinding, a mixture of gelatinised starch paste and lactic acid (30 to 48 per cent. of acid and the remainder starch). In this way the bicarbonate which is added subsequently is protected from interaction with the lactic acid until mixed in the dough.

A patent was also granted to Tollner[4], who describes a process for using the dried peel of citrus fruits in place of the usual acid ingredient, the sodium bicarbonate being replaced in the powder by magnesium carbonate. Here again the effective acid reaction is restricted by the organic bodies of the peel.

In this country, Berry took out a patent for spraying phosphoric acid into agitated flour[5]. In a patent by Grelck[6] the acidic ingredient consisted of the dried solids of sour milk, and somewhat in contrast to this we find a process[7] involving the coating of one or both of the reacting ingredients with a film of solid cellulose acetate or formate. Although deterioration should be amply prevented by such a process, it seems that the resulting baking powder could not be considered ideal on account of the fact that the CO_2 would only be liberated at relatively high baking temperatures.

Other patents have been concerned with the use of special acidic ingredients with the object of either producing a more stable powder or a slower evolution of gas. Borner[8] has suggested the use of urea phosphate, while another German patent[9] was granted for the use of fumaric acid. In 1931 Riedel[10] took out a patent for the use of adipic acid and its salts. This acid has the distinct advantage of being non-hygroscopic, and baking powders prepared from it are very stable; moreover, the cost has become competitive with that of the more common acids. Mucic acid is another chemical which has been suggested for baking powders, and its properties are similar to those of adipic acid.

A special method of using tartrates and phosphates was patented in 1914 in Germany[11], whereby normal alkali tartrates and phosphoric acid were mixed and evaporated to dryness; a mixture of alkali hydrogen tartrate and primary alkali phosphate resulted which was only spar-

ingly soluble, thus steadying the rate of evolution of gas when used as the acid ingredient in baking powders.

A few patents have been taken out relating to the filling material. The patent mentioned above[4] may be regarded as coming under this heading, and Weil[12], in this country, patented the use of a neutral anhydrous alkaline earth, or magnesium pyrophosphate, as a filling material. The use of such compounds keeps the powder in a dry state during storage.

Recipes

It will be realised from the foregoing that it would be difficult to give details of recipes for more than a few types of powder, owing to the enormous number of possible variations of each basic ingredient, quite apart from combinations of one with another. The following table will serve to show the general make-up of a few types:

	1.	2.	3.	4.	5.	6.
Sod. bicarbonate ..	100	100	100	100	100	100
Acid calcium phosphate	11	—	—	124	—	—
Sod. pyrophosphate	140	—	—	—	—	—
Tartaric acid ..	—	91	—	—	15	70
Cream of tartar ..	—	—	204	—	160	15
Starch	88	240	80	200	120	200

NOTE.—Alum powders are not included in the above, as aluminium salts are prohibited in this country.

Analysis

Apart from the usual determination of "available CO_2" and total CO_2, which it is always advisable for manufacturers to make at intervals, it will perhaps be as well to mention briefly a few of the analyses which should be made if a feeling of security is desired. Arsenic should be tested for, as this is not an uncommon impurity, and prosecutions have taken place for amounts of 2 gm. per lb. or less. Calcium sulphate, which always seems to be described in reports of prosecutions as "plaster of Paris", is also a possible impurity arising from the use of low-grade calcium phosphates. These are probably the two most important analyses to be made, apart from the CO_2. Regarding this latter determination, many methods have been published from time to time, and these are given in the usual textbooks.

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A picturesque scene in New South Wales.

Carting Wheat by Bullock Team in Australia.

WHEATEN FLOUR
and its more important
CONSTITUENTS

By C. W. HERD,
Ph.D., B.Sc., F.I.C.

FLOUR TO the casual observer consists of small particles of material which have come from the centre or endosperm of the wheat berry. When water is added and the whole well mixed, a plastic dough is formed, which varies in character to some extent with the other ingredients used in the dough mix. These ingredients depend on the type of article to be produced—it may be an attractive, crusty loaf of bread, or it may be some form of cake or gâteau or a wholesome pudding. How many of the users of flour or the consumers of the ultimate edible goods stop to think of the fundamental composition of the flour or of what this may mean to their product? Flour is just flour to most people, and yet wide fluctuations may occur within the flour particle itself; two seemingly identical flours may have many differences among their essential constituents. Wheats may come from Canada, U.S.A., Australia, Argentine, Russia, India, or Europe, and the endosperm from each of these will yield flours of different character, so much so that it is necessary to know as much as possible about the chemical and physical characteristics of each kind of wheat. The flour milling industry is not lagging behind other industries in its endeavours to probe the secrets of its raw material and its final products.

What may be called the "crude" composition of flour has been approximated by Kent-Jones as follows:

Starch	65-70 per cent.
Proteins	9-14 ,,
Water	13-15 ,,
Cellulose and fat	1 ,,
Sugars	2·5 ,,
Mineral matter (ash)	0·5 ,,

A rapid and superficial analysis of almost any flour would show it to come within the range given in the above table, but this would mean little and give but scant insight into the actual properties of the flour. It will readily be realised that, with the exception of water, all the components of flour are of extraordinary complexity and are as yet imperfectly understood. Even the mineral matter is not of simple composition, and in view of recent work in dietetics emphasising the importance of traces of mineral substances in food, this constituent of flour assumes greater significance. Further, the table of constituents takes no cognisance of the enzymic activities, and these are far from being of negligible importance, but naturally their inclusion in a numerical table is difficult. No wonder then that the fundamental structure of flour is as yet unknown, but progress has been and is being made, and it provides an interesting story from the earliest scientific researches until the present day. Although starch is numerically the most important, it has not received as much attention from cereal chemists as have the proteins. The reason for this is that the view has been held very generally that these protein bodies controlled more of the secrets of dough properties than did any of the other constituents. Following, therefore, the time-honoured custom, the proteins will be given first consideration in this article. It may be thought that too much space is given to this, but that is solely due to the fact that the proteins have been disproportionately studied by workers in this field.

The Proteins

As is well known the proteins constitute a class of bodies found in all living cells and are one of the factors essential for animal life. This probably accounts for the

preferential study given to them in wheaten flour. If a ball of dough (made from only flour and water) be worked carefully under a small flowing stream of water, it will be found that the white starch will be gradually washed away in the stream, leaving behind in the hand a ball of plastic material, which is called gluten. This consists very largely of proteins and suggested to early workers that the proteins were responsible for the valuable dough-forming properties of wheaten flour. Examination of these gluten balls will give some practical help in predicting dough behaviour, and the test is still used in this country for guidance to the miller on matters of "quality," which will be discussed later. The classical work of Osborne and his co-workers on the vegetable proteins fortunately included the wheat berry, and these pioneers were able to show the presence in flour of the following proteins: an albumin, a globulin, a glutelin, a prolamin, and a proteose. Of these the more important and those present in larger quantities are the glutelin and the prolamin, the actual constituents of wheaten flour being called glutenin and gliadin respectively. Osborne and Vorhees considered critically the views which had been put forward previously and could not agree with a "ferment" hypothesis, which had been suggested by Wehl and Bischoff. This theory maintained that there was a "globulin" in flour, which was the mother substance of gluten and which was converted by a "ferment" into gluten when water was added. This so-called ferment has not been isolated and chemists have followed on the lines indicated by Osborne and Vorhees—namely, that gluten contains essentially two protein substances, gliadin and glutenin, and that these are present in the flour itself in the same form as in the washed-out gluten, with the exception, of course, of the combined water. Gliadin was the protein soluble in 70 per cent. alcohol and glutenin that soluble in dilute alkali. Jago regarded gluten formation as a simple and direct hydration of the gluten compounds existent in the grain, and adduced that both glutenin and gliadin were necessary for the production of gluten.

The natural sequence to this work was to concentrate on the gluten properties and its two essential constituents. First of all may be considered the analysis of gluten, as it was only natural to search for the well-known differences in gluten in the varying proportions of the two proteins. Fleurent came to the conclusion that the ratio of glutenin to gliadin should be 1 : 3 in order to obtain the best results, and that if this ratio decreased to 1 : 4 or increased to 1 : 2 then doughs of less desirable qualities were obtained. Further, Guthrie found that increasing gliadin quantities gave sticky and inelastic glutens, but all the workers were not in agreement and many contradictory conclusions were published, so that it was extremely difficult to bring all these results into alignment or to account for dough properties on the basis of these glutenin-gliadin ratios.

Wood advanced our knowledge further in his classical work on the subject. He formed the opinion that the glutenin-gliadin ratio did not give any indication as to the strength of the flour, nor did the absolute percentage

Virgin Wheat Country.

Wheat Experimental Plots in Victoria.

of gliadin present. He introduced two independent factors as being of importance in the matter of baking quality; one of these he suggested governed the volume of the loaf and the other controlled the shape. Further study led Wood to the belief that the sugar content of flour was of fundamental importance in regulating gas production by the yeast, and here was the factor governing the loaf volume. This differentiation of the gas-producing factor in baking quality was a first definite attempt to analyse the conception and was probably not appreciated immediately, but recent workers in many parts of the world have emphasised the very great need for distinguishing the gas-producing factor from others, because it can be so readily adjusted at the time of baking. Thus, if there is a shortage of gas during fermentation, the addition of a little sugar when making the dough will give greater food for the yeast and consequently increased gas production.

Then began the search for Wood's other factor, namely that controlling the shape of the loaf. Wood and Hardy were led to the study of the effects of electrolytes on gluten, and found that acids and salts had very marked effects on the dispersion of this body. They came to the conclusion that the condition of the gluten was influenced by its environment. This is the foundation for the physical or colloidal-chemical theories of gluten structure and, owing to the failure of the chemical theories, very much attention has been given to the study of this phase of flour. It promised to be very fruitful of results and has no doubt been extensively pursued to the practical exclusion of the chemical theories, and with almost complete disregard of the chemical constitution of gluten.

It is not necessary to recount all the stages of this colloidal study, but it is only natural that attempts should be made to measure dough qualities by the application of physico-chemical methods. Viscosity was the first of these methods to be applied and many valuable contributions have been made to our knowledge thereby; among the prominent workers may be mentioned Ostwald and Luers in Germany and Sharp and Gortner in America. The former emphasised that it was the quality and not the quantity of gluten in a flour which determined its character, and they pointed out that the quality was regulated by the salts present in the flour or finally in the dough. The American workers went further and stated that since gliadin could be largely removed by extracting with water, and imbibition with acids took place after such extraction, therefore the glutenin must be the protein mainly responsible for the imbibitional properties, and they state that viscosity will give a measurement of the colloidal properties of glutenin. They deduced a logarithmic relationship between the viscosity and the concentration of the flour in a water suspension and from this a numerical value to represent the glutenin quality. Further work, however, did not altogether substantiate these claims.

Kent-Jones was the first to study the effects of heat on the colloidal properties of flour, dough, and gluten, and several interesting deductions have been made by him. He has shown that heating, under certain conditions, can enhance markedly the baking properties of flour and that such treatment always increases the viscosity, and from this it was assumed that it increased the imbibitional power of the gluten. If heating has been carried too far the flour cannot be used alone for baking purposes, as the gluten becomes too "short" and snappy; it is of interest to recollect that the natural gluten from certain wheats—*e.g.*, Indian and Persian—show these same characteristics to some degree. Kent-Jones proposed as a result of this work that the properties of a gluten could be related to the degree of colloidal dispersion of the proteins. He maintains that an alteration in the degree of colloidal dispersion in the direction of coagulation increases the swelling and binding powers of the gluten. "In heating wheat, it seems certain that such a step (*i.e.*, an increase in the degree of aggregation) is performed." As noted above, however, there is a definite limit to this action if the flour is to be used alone for baking; that is to say, above a certain state of aggregation the protein particles cannot be used for bread making without modification. Such a theory is, therefore, the climax of the physical aspect and ignores entirely the chemical viewpoint. It has been termed by American workers the "Optimum coagulation theory." There can be no doubt that this has been of great value in focussing attention on the importance of the physical state of the protein particles; it forms an explanation of some of the characteristics of Indian and Persian wheats—namely, that the proteins of these wheats have been coagulated by the heat of the sun to a greater degree than have those of many other wheats.

In 1930, the present writer summarised the position: "The view is generally held now that the quality of the proteins is one of the main factors controlling baking properties and that this 'quality' factor is determined largely by the imbibitional power of the proteins—*i.e.*, the col-

loidal condition." Swanson has given a very clear picture of this theory of colloidal behaviour. He states: "We have at least two continuous phases, water and the gluten meshwork. In this double continuous system we hold the starch grains as well as the non-gluten proteins all covered by a film of water. In this water are found the molecularly dispersed salt, sugar, and simpler organic compounds, such as amino acids or soluble proteins. . . . Into this most complex environment we place the yeast plant. When we make a baking test we thus deal with physical, chemical, and biological forces and the baking test becomes one of the most delicate tests we can imagine." Baking quality will depend, therefore, as one essential, upon the colloidal dough structure and upon the strength of the fibrils of the protein meshwork, and these in turn are determined by the colloidal condition of the protein particles in the original flour. The strength of these fibrils will depend to some extent also on the number of the protein particles—*i.e.*, on the amount of protein present.

It is quite evident that the physical theories do not present the whole picture, and it is very significant that recent work on one aspect has been directed to the estimation of the individual proteins in flour. Solubility determinations have shown that the proteins soluble in salt solutions and those soluble in alcohol are closely associated and probably do not constitute definite chemical entities. The designation "gliadin" for the alcohol-soluble protein, as used by earlier workers, has little meaning. The agreement between the various methods for "glutenin" extraction was at first thought to indicate that this might be more of a definite entity than the other proteins of flour, but later work has shown that alkali causes a definite irreversible alteration of the glutenin protein, depending on the conditions of extraction, so that it is not certain that this is a definite chemical entity. It has been suggested that while alcohol disperses a large portion of the gluten protein, the extraction under any given conditions is apparently never complete, and further that the different protein fractions, which can be isolated, are found to vary systematically both in physical properties and in chemical constitution. Three groups have been proposed, classified on their solubilities—viz., a "gliadin" group, readily soluble in neutral alcohol (50 to 70 per cent.) and in dilute acetic acid; a "glutenin" group with low solubility and little dispersion in dilute acetic acid; and an intermediate group with intermediate properties. The solutions of flour proteins are probably not true solutions of chemical entities, therefore, but are colloidal sols, whose composition will vary according to external influences. Thus the earlier work based on the "estimations" of the various proteins was liable to be vitiated by the use of different methods of extraction, and this, no doubt, accounts for the divergent figures and the differences in opinion expressed by these first pioneers.

A few years ago Bungenberg de Jong and Klaar in Holland tackled the subject systematically from a sound basis. They studied in the first place the pure gliadin sol, or more correctly the gliadin fraction sol; this fraction was extracted from finely powdered gluten (dried at not more than 40° C.) with 70 per cent. alcohol; every care was taken that at no stage was the alcohol heated. This gliadin so obtained had the same properties as the protein obtained by shaking gluten with acid. A detailed study of this body was made, showing in the first place the influence of varying alcohol concentration on positive and negative gliadin sols. There was found a maximum in relative viscosity at an alcohol concentration of 48 per cent., which is supposed to be due to the formation of an alcohol hydrate layer around the particles of protein; at higher alcohol concentrations this layer is believed to be removed gradually with a fall in relative viscosity. The influence of H-ion concentration at this maximum was studied. A very interesting phenomenon was observed by these workers: when dilute alkali was added to the solutions obtained by shaking gluten with acid a milky cloudiness appeared, which was seen microscopically to consist of little globules with vivid Brownian movement. On increasing the alkali concentration the drops grew larger in size and the Brownian movement decreased and eventually flocculation took place. This phenomenon was termed "separation", and generally it was shown that by discharging a charged gliadin sol with electrolyte these drops can be observed. By the action of solvating agents the drops could be driven into solution, but on the other hand dehydrating agents will give a very fine flocculation. Later it was shown that all proteins could "separate" if the conditions were right.

Some industrial chemists were inclined to criticise this work as of only academic interest in that it dealt with pure gliadin and not with the conditions of the protein as exist in the baker's dough, but the Dutch workers proceeded unperturbed. They enquired: "As it is possible to separate a gliadin sol by discharge by electrolytes, can the same be done by the action of another protein? If we mix two protein solutions, both of the same hydrogen ion concentration (in this case gliadin

Harvesting Wheat in the Derwent Valley, Tasmania.

and glutenin), will they exercise any influence on each other? It is quite easy to understand that this will be largely dependent on the charge of the colloidal particles in the two sols. If both have the same charge—let us suppose for a moment a strong positive one—then an obvious influence is scarcely probable. In the case of the charge of one of the two sols being the reverse of the other a certain influence is to be expected on account of the electric forces." They argued that gliadin and glutenin will be of different charge in the region between the two iso-electric points of the two proteins, and that if any interaction took place then there would be expected a deviation from the law of additive properties. The iso-electric points were found to be *p*H 5·3 to 5·4 for glutenin and *p*H 6·5 to 6·6 for gliadin. The properties of the two pure proteins in water must be noted—namely, that gliadin forms a sticky mass that can easily be stretched into threads, while glutenin on the contrary gives a flaky mass without much coherence.

These workers were thus led from the study of the pure protein gliadin to the binary protein mixture glutenin-gliadin. Definite evidence of complex formation was obtained within a certain *p*H range; thus it is given that at *p*H 6·4 the positive component (gliadin) is entirely in the complex, an excess of negative component (glutenin) acting as a protective colloid. On decreasing the *p*H, more and more of the negative component will go into the complex; at *p*H 6·1 the maximum is reached when both the positive and negative components are completely in the complex, and beyond this point the positive component will be gradually set free and will then act as a protective colloid. This theoretical gluten is a complex formed by gliadin and glutenin, caused by the different charges of the components. The gliadin is always positively charged in the complex, while the glutenin is always negative. Gluten formation is strictly limited to the *p*H region between the iso-electric points of the components; maximum formation takes place at a definite *p*H, which is only dependent upon the ratio between gliadin and glutenin in the system. In a range of about 0·5 *p*H units at both sides of the maximum a kind of complex formation can also take place, but such complexes are imperfect. In these systems only a certain amount of one of the components will take part in the complex, the remaining part of this protein serving as a protective colloid. At other *p*H values the additive law was found to be strictly followed.

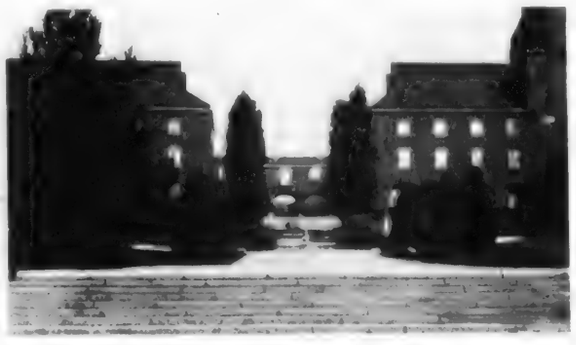
From this these authors took up the study of natural gluten and found definite similarity between this and their artificial gliadin-glutenin complex. They concluded, therefore, that "*Gluten is not a simple physical mixture of gliadin and glutenin, but its existence is dependent on an interaction between the components. This interaction is caused by the opposition of charges on the two components of the complex.*" The ratio of the two components in this complex must have some importance, and the analogy is deduced further: "In the complex containing gliadin in excess the particles of glutenin will be embedded in a large quantity of a semi-fluid mass of gliadin. As a consequence, the displacement of the solid glutenin particles along each other must be easier. The complex can be easily stretched but will have only small elasticity. This is the image of a soft weak gluten. In the case where the glutenin predominates in the system the complex will break abruptly on stretching. The results of experiments with extra gliadin or glutenin added to a gluten were in accordance with the above deductions."

By investigation of the complete peptisation (*i.e.*, a more or less coarse suspension of glutenin in gliadin sol) of these gluten proteins it was shown that the softer glutens require less time than do the stronger glutens for peptisation, and thus it can be argued that the physical size of the glutenin particles may be an important factor in determining the quality of the gluten. Thus it is stated: "If the glutenin particles—embedded in a tough mass of gliadin—are small the tough properties of the gliadin will be only slightly damaged. An increased magnitude of the glutenin particles will cause the gluten to break more easily when stretched."

A further point to be considered is the presence of other proteins which may also take part in this complex formation; the iso-electric points of these other proteins are at lower *p*H values than gliadin and therefore in the region of gliadin-glutenin complex formation, these will be negatively charged and this shift the point of maximum complex formation to a lower *p*H and may therefore alter the physical state and properties of the complex. Low grade wheat flour contains more soluble proteins than patent flour, and this would suggest that the point of maximum complex formation should be at a lower *p*H with low grade flour than with higher grade flours. Bungenberg de Jong has shown this to be so.

This latest classic work from Holland has thus been instrumental in correlating the early work of Fleurent, the "optimum coagulation" theory of Kent-Jones, with the basic complex formation theory deduced from observations on the pure proteins. It takes into account the effects of other substances in the dough and can explain certain known properties of dough. Thus from the investigations on gluten it was concluded that on the acid side the gluten complex would be short and brittle, whereas on the alkaline side a more tractable and extensible gluten could be expected. In accordance with this theory it was found that on the acid side the time required to reach the breaking point was much shorter than on the alkaline side.

(*To be continued.*)



A View of the Technical Institute, Stockholm, taken by the Editor during a recent visit.

Milk in Bread?

Edmund B. Bennion, M.Sc.Tech., A.I.C., of the National Bakery School, London, adds his contribution to the Discussion, and Patrick J. Shortt makes a reply to F. E. Thomas, M.A. (see July issue).

The results of some actual experimental work carried out on this subject by Mr. Shortt will be described in our next issue; he will also deal with some of the points raised by Mr. Bennion. The Discussion will close with a "summing-up" by "Ignoramus".

EDMUND B. BENNION

THE QUESTION of the use of milk in bread has been very ably dealt with by your two contributors, "Ignoramus" and Mr. P. J. Shortt, and both have surveyed the subject somewhat fully each in his own particular style. At the conference of the National Association of Master Bakers, held at Llandudno in June, the opening paper of the conference was on this same subject. In this case the paper was prompted by the Milk Marketing Board offering preferential terms for the purchase of liquid milk supplies if bakers would undertake to use 6 gal. per sack. The main idea behind this offer was apparently an attempt by the Milk Marketing Board to find a market for surplus liquid milk.

The general views expressed by members of the conference may be of interest, since they are those of the manufacturers of bread and the salesmen of bread who have a considerable knowledge of the outlook and viewpoint of the customers.

The results of the investigation carried out by Mr. Rees-Jones at Wrexham and the author of this article at the National Bakery School in London were to the effect that from the viewpoint of using liquid milk, 6 gal. was too great an amount for normal manufacturing processes, although with special working it could be used, but that 4 gal. of milk per sack of flour could be used with safety under most conditions to produce an improved loaf, provided that the milk was always obtainable in a fresh condition.

It was, however, pointed out that sterilised milk was the safest and most satisfactory to use, but that it was doubtful whether sufficiently general facilities would be available to ensure supplies all over the country. The need for homogenisation if a proper distribution of fat was to be obtained in the milk prior to its being used in the bread was also dealt with. Details of modification of method were also discussed, which are of particular interest to the baker and ultimately the customer by the improvement effected in the loaf.

The question of extra cost was considered, and it was generally agreed that an extra farthing a loaf would be necessary to cover the cost of the milk as well as many other charges which would be incurred, such as handling of milk churns, cleaning of churns, extra storage space, and so increased overhead charges. The extra cost would also be warranted because of the better quality of flour generally used in milk bread. The outcome of these deliberations, however, was that with few exceptions it was considered that the use of liquid milk would not be practicable in bread making. It should, however, be pointed out that it would be very suitable for confectionery and cake making, more particularly owing to the very much smaller quantities required and also to the very different nature of the products manufactured and the processes employed, no fermentation being necessary.

It was, however, considered that dried milk was the most suitable form in which to use milk. This is largely the practice to-day, and for the past ten years increasing amounts have been consumed in the bakeries of this country, and so promising has been the market that this country has become the dumping ground for milk powder from all parts of the world.

Why Milk Powder is Used

It will be as well for us just to review a few facts as they appear to the baker. Milk powder is largely employed, in conjunction with fat, to the extent of about

1·8 per cent. of skim milk powder and 1 per cent. of fat on the weight of flour, because it produces a loaf of bread with a pleasant aroma and flavour, a soft tender crumb which should be moist and remain moist for several days, and a pleasant biscuit-like crust which eats short and crisp instead of tough, as so many crusts do to-day. In other words, good milk bread is a superior loaf, particularly as far as the eating and keeping qualities are concerned. It should here be mentioned that all milk breads do not come up to this standard; that is not due to the use of milk but to faulty manufacture, which may arise because of the need for modification of process when liquid milk is used. Such necessary alterations are not always satisfactorily made.

Milk bread also produces good toast, crisp and appetising, with an even golden coloured crumb of tender formation, while ordinary bread is inclined to give a harsher, more flinty crumb and to take on the fire unevenly during the toasting operation. Up to recent years the majority of the public have not been concerned with increased food values, and to-day there are many sections which are not concerned, even though advertisements point out certain advantages to be derived from the consumption of bread.

"Ignoramus" points out the very small amount of milk which can possibly be present in a loaf, and when the solids in this ½ pint are considered, the extra food value can be calculated. It does not exceed 2 per cent., and if the addition of milk to bread is specifically for this purpose then food publicists are backing the wrong food as a means of introducing milk to the people, but if they are backing the consumption of bread of a more pleasing type, then the fact that it contains milk is an excellent advertising factor. Like many publicity ideas, a smattering of truth is sometimes a better selling point than the whole truth. It is, however, amazing how people will listen and think twice when the salesman says, "Oh! but this is a milk loaf," and the housewife thinks immediately it must be better, and if it proves to be so she will continue buying it and also will have no objection to paying more for it, simply because it tastes better than the bread to which she has been accustomed.

There are many parts of the country where water bread is preferred and where milk bread has only a limited sale. There are many places where, whether industrial conditions are good or bad, 75 per cent. of the bread sold contains milk products. Whether milk bread is popular or not is a matter of individual taste and varies from individuals to localities.

There is no more reason why all the bread of the country should contain milk solids than that it should contain a weekly dose of Epsom salts! They would both be good for people and the cumulative effect might be remarkable and very beneficial.

Effect of Milk on Yield of Bread

From the use of milk in bread every sack of flour would produce an average increased yield of 2·5 per cent., so that if milk powder becomes employed to a greater extent we shall find the millers and wheat producers bemoaning the decreased consumption of flour. What about the farmer then! What he is making on wheat will be transferred to his milk and so the nett gain may be nil, or even a loss might be experienced.

The extra yield is obtained because, from the practical point of view, it is impossible to make satisfactory milk bread except by using a greater percentage of liquor per sack of flour. This is generally about 7 per cent., depending on the type of bread being produced. If this extra liquor is not used, inferior bread from the eating and keeping qualities point of view is obtained, because of the effect of the milk solids on the flour solids, in particular the gluten.

Quantity of Milk Powder

The quantity of milk powder employed in this country corresponds to 5 gal. of skimmed milk per sack of flour, and with it the equivalent of 3 lb. of lard is used.

In America the Dried Milk Institute, with which Mr. Shortt has been connected, have been advocating the use of three and four times this amount. Mr. Shortt, in his article, suggests the use of 12 lb. of skim milk powder per sack. If such quantities were used then there would be an increased quantity of milk sugar, mineral salts, and protein per loaf of bread, but even the amount of extra nutrition supplied in this way would be relatively small and certainly would be more easily supplied by full cream liquid milk; further, they would only be present by the replacement of valuable flour solids.

Before extra rations of milk mineral salts can be effectively introduced *via* bread, the nature of the bread would be radically altered, and it is very doubtful whether such bread would appeal to the public taste. The greater the amount of milk solids added, the smaller the volume of the loaf and the closer and more solid the crumb. An appetising loaf should not have too solid a crumb, as this satisfies far too readily, so that such bread would in part defeat its own object by reducing the *per capita* bread consumption.

For the English palate 5 lb. of milk powder is considered adequate. If it is intended to introduce more, the public would have to be educated by suitable advertising. In this way small demands might be created, but the expense would be required to be spread over a long period of years before beneficial results were obtained.

Cost of Bread

Mr. Shortt showed in his formula and calculations that milk powder and fat could be incorporated without any extra charge being made for the loaf of bread. One can appreciate this part of his calculations and agree for the most part, as he bases them on the assumption that he is going to convert the so-called "better" loaf, for which an extra charge is already being made, into a milk loaf. He shows fat and malt in a water bread dough, but there are few bakers working at the Food Council scale of prices who could afford these additions. His flour is based on straight run flour prices. Mathematically his figures are correct, but his formula is somewhat removed from general practice. One other point; he asserts that

fermentation losses are reduced by the use of milk and that he can scale off his bread 1 oz. less. What authority can he give for his statement concerning fermentation loss and also for the scaling of 1 oz. less? It is often claimed that ½ oz. can be saved, but this depends on other conditions than just scaling. Were Mr. Shortt to commence in business in this country I am afraid he would soon be answering summonses for short weight unless he made all tin bread and mostly under tin at that. The production of crusty bread will prove fickle work if scaled off at 1 oz. less than tin breads.

Bread at present is sold at far too low a price for a fair economic return to be obtained by the baker, and as long as the Food Council scale of prices operates, so long will it be impossible to produce any other than the water bread.

If milk is going to be used, then a better loaf will be obtained, not necessarily with a much greater nutritive value, but a sufficiently improved loaf will be apparent to the consumer as to warrant an extra charge per loaf. Such an extra charge will be required to pay for a better grade of flour; the extra milk solids and fat and advertising for this will be most necessary if the consumption is to be stimulated. On these lines milk may find a wide market, but if bread is to be loaded with milk solids so that a definite increase in mineral salts can be guaranteed, or some specific claim of improved food value made, then it may defeat its own end, for the public will not care to think that their bread is being made the medium of introducing something which they would rather have in some other way.

PATRICK J. SHORTT

BORN and reared in the Emerald Isle, with all of the distinguishing peculiarities of the Celt, shure an' there's nothing in the world to me as spiritin' as a good free-for-all argument or something!

In the February issue of FOOD MANUFACTURE "Ignoramus" presented an able case against the use of milk in breadmaking, and being somewhat familiar with the subject through my own experience and observation of the advantages derived by thousands of other bakers, I expressed my views in an article published in the May issue.

Now enters the controversy F. E. Thomas, who claims to stand more or less halfway between in the matter, and whilst admitting the value of milk in bread, taking issue with me on some points, the burden of his argument is to surround the use of milk in bread with a network of legal pre-requisites, as if bakers were incapable of handling such matters themselves.

As I see it, the difference between these two writers opposing milk in bread is that "Ignoramus", consistent in his argument, adhering closely to his points, is apparently sincere. You can argue with a fellow like that, because you know where he stands, but, on the contrary, Mr. Thomas presents an argument against milk that is as elusive as the proverbial flea; when you put your finger on it, it's not there. And since he reaches out beyond the issue to take a wallop at the poor farmer who is totally ignorant of what it is all about, and again to hurl innuendos at the dairy industry and its representatives, I must confess to being rather doubtful of the genuineness of any of his views.

In the course of his remarks, Mr. Thomas says: "The use of milk in bread seems to be determined by whether the disputant is a seller of milk or a maker of bread, and the public who eat the bread with or without milk solids has very little to say in the matter". In this connection I would like to remind him that the use of any pure food substance as an ingredient of bread is determined solely by what values it imparts to the finished loaf and other benefits derived from its use, measured against the cost; and, further, that neither the public nor anyone else usually has very much to say about any ingredient the baker elects to use provided it is a pure wholesome food substance. But if the ingredient is not of this character, the public might have something very definite to say about it.

For some reason or other he presumes that "Ignoramus", who opposes milk in bread, represents the bakers' views in the matter, and that I, who favour its use, must represent only the milk vendors' views. His assumption is entirely erroneous, for I, a baker myself, have been closely identified with the baking industry for the past thirty-five years and in a number of constructive capacities have striven in its interest. However, it is my firm conviction that my endeavours toward better and more nutritious baked goods through the use of milk solids is as constructive as any other work carried on in the interest of the baking trade.

He states that the milk in bread campaign in this country (the first I've heard of any campaign, unless he, most graciously, dignifies my poor effort as such) is designed first and foremost to benefit the farmer.

Coming from a scientist, this is an absurd argument, inasmuch as all industries are inter-related, each industry helping the other to improve its products and thus justifying its existence. It would be just as unreasonable to say that mechanising the baking business is designed in the interest of the steel industry or that those who favour the use of fat in bread do so solely in the interest of the meat packing industry.

In his opinion, the farmer is the spoiled child of the community, but Mr. Thomas is willing to scrap his opinion and is quite prepared to accept the reverse notion that farming is deserving of a little more kindness and consideration, provided that those supporting the farmer agree that the baking trade deserves equal consideration. The farmer should feel mighty elated over that little nicety of Mr. Thomas's. This, of course, has nothing at all to do with milk in bread, but an opinion that is as loosely held as that, and is so capricious that it can flop to this side or the other at will, is a frivolous one indeed.

Just as frivolous seem the other opinions which compose the structure of his argument, and I am at a loss to know how he reconciles them one with the other. For instance, the following:

"Unfortunately you can get anything into bread"; then, "milk in bread is quite well known"; then, "milk is an excellent addition to the value of bread"; then,

"the milk protagonists don't care in the slightest whether it helps the baker or not"; then, "the baker is already overburdened with legislation"; and finally he says that we should enact more laws to compel the baker to use milk, and laws governing the price he shall charge for his product, as the only fair way for him!

In troth, it's hard to know whether Mr. Thomas is for or against the use of milk in bread, for although he argues against it he proposes legislative compulsion of its use as the only fair way for the baker!

Bakers know best how to conduct their own business, and milk in bread protagonists have never proposed, nor have they the slightest interest in, any plan of enacting laws to compel the baker to do anything, let alone compel him to use milk, as Mr. Thomas proposes.

He characterises the dairy industry and its representatives as a crafty and deceitful lot who by some magic or other get the baker to use milk, caring not in the slightest whether it helps him or not. Well, as I have already pointed out, I have been in the bakery business and closely associated with it for a few years. I have on my own account and as a buyer for large baking organisations dealt with supply manufacturing concerns, supply brokers, and sundriesmen. I have spent considerable time on the opposite side of the buyer's desk, selling supplies, and have had close association with hundreds of bakery supply salesmen. But I am proud to say that I have yet to find the supply concern or its representative who does not care in the slightest whether the commodity offered helps the baker or not.

Does he think that the thousands upon thousands of bakers who use milk in breadmaking are gentle passive creatures who can be imposed upon with impunity? Does he think that the dairy industry was built up on such flimsy and unfair dealings as he ascribes to it? Does he think that milk brokers and bakers' sundriesmen are trying to slip something over on the unsuspecting baker when they sell him milk powder? If he does I am not surprised at his statement, but if he does not think these things, then let's be charitable enough to attribute his remark to hastiness, and agree that upon due reflection he would not have written such imprudent lines.

Forgetting salt, he says that a fact that will always hold true is that flour is the cheapest solid that can be used in dough, and the substitution or addition of anything more expensive than flour will increase the cost of the raw materials. Assuming this to be true, the additions may improve the quality of the bread, and may not increase the cost of the finished loaf. Mr. Thomas is himself engaged in offering a bread improver to the trade, for which is claimed an increase of 8 lb. of baked bread, resulting from the use of 1 lb. of his product, but he assumes an unbelieving air at claims which are in comparison most modest.

It must be borne in mind that the prime reason for the use of milk in bread is to improve its value as a food, to fill the deficiencies of minerals and other food elements in white bread, for which deficiencies it is eternally criticised. The cost is a secondary consideration to be measured against the value of the improvements. It is not to the best interests of the baker to build his products down to a price, but rather up to a quality by the addition of those pure food substances best suited to the purpose, and any legislation at present existing that might stand in the way of this most desirable end should be suitably readjusted.

Now let us get down to the question that so perturbs Mr. Thomas, that of an illustration I used in my last article. If he wants to be fair he will read it again, and he will note that I distinctly pointed out in the illustration that the baker was not in pocket through using milk, as appears by an incorrect method of cost finding so generally in use. In contradistinction to that method was illustrated the correct one, which showed that the use of milk cost the baker little or nothing.

He quibbles about an error of mine in the cost of fat, disregarding the fact that the same cost is applied on both sides, the error amounting to 1/15 of a farthing per pound of dough. He states that the lesser fermentation and baking losses indicated are at variance with any other opinion he has ever heard and not supported by such tests as he has made or heard of. I, in turn, challenge his statement that he made tests with milk solids in bread for such determinations.

He asks for chapter and verse, and I could give him dozens of them. Here is the most recent verse in this connection, and one that will convince anyone. It is taken from Mr. W. Rees-Jones's most exhaustive test at the Bakery Department, Denbyshire Technical Institute. Mr. Rees-Jones says: "Particular attention was paid to the amount of weight lost by each bread during baking and keeping. The bread containing milk lost considerably less weight than that made with water alone. We found it quite safe to scale the dough containing the milk a half-ounce less than the water dough for half-quartern loaves, thus saving approximately 6 lb. of dough to the sack."

The percentage of milk solids discussed in previous articles on this subject by "Ignoramus" and myself is just double the amount used by Mr. W. Rees-Jones, and careful scientific research has shown that the baking and cooling losses in bread decrease progressively as the milk solids content of the dough is increased. This together with lower fermentation loss is supported by general commercial practice.

Mr. Thomas states further that bread containing even a lower amount of milk solids than recommended goes dry more quickly than ordinary bread, and that bakers who use milk solids add a generous amount of fat to make up for this defect.

Now let me tell Mr. Thomas that when milk bread goes dry, or the fermentation time is unduly retarded, it is the surest indication that insufficient extra water has been added to the dough. Skim milk powder will absorb 1 to 1½ times its weight of extra water, and if this is not introduced into the mix, fermentation may be retarded, the loaf may not have good oven spring, and the bread may have a tendency to dry out. A dough in which a good quality of powdered skim milk is used in the right way will not require longer fermentation or more yeast, nor will it require more fat to prevent rapid staling of the bread.

(*Continued on page* 326.)

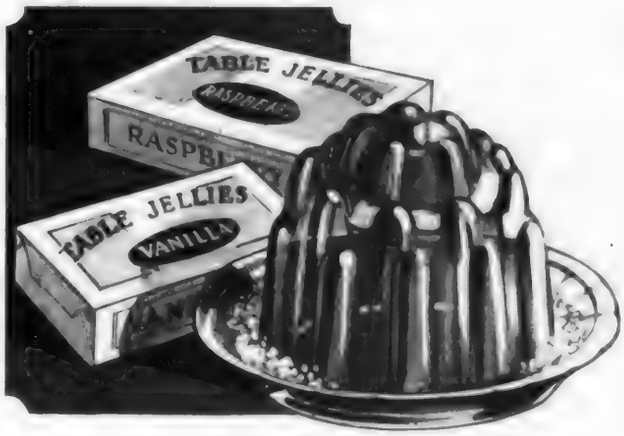


TABLE JELLIES

Their manufacture described by J. MacCall.

FEW COMMODITIES in general use have shown such improvement in recent years as table jellies. This is due to a variety of causes, chief of which are the introduction of the cubing machine and the undoubted improvement in the quality of gelatine now offered at a price suitable to the manufacturers of this product. It is pleasing to note, too, that British manufacturers are now offering serious competition to the Continental producers.

Whether this improvement in quality or the more general appreciation of the food value of gelatine is responsible, the fact remains that the consumption of table jellies in this country would appear steadily to increase.

Testing the Gelatine

As gelatine is the most costly item in the table jelly, and as the quality of the jelly depends very greatly upon the grade of gelatine used, great care should be exercised in the buying of this material. The following tests should enable the manufacturer to obtain the grade most suited to his requirements.

Having obtained the required samples, solutions of about 3 per cent. strength should be made up. This is best done by soaking the required quantity of gelatine for an hour or two and heating to dissolve, care being taken that each sample is submitted to the same degree of heat and for the same length of time. Now, as the final product is acidic, the proportion of acid present in the finished jelly should be added. This will have the effect of increasing the clarity of some gelatines and diminishing that of others. The samples should be placed in suitable receptacles of glass and allowed to set overnight, when they will be examined for clarity and strength.

In testing for clarity, "water-whiteness" should not be confused with transparency. The more expensive gelatines are usually water-white, but one having a slight trace of colour is often as clear and brilliant, and, after all, a tinge of colour is of no great consequence when colouring matter has always to be added to the final product.

The strength can be fairly accurately determined by depressing the surface of the gelatine with the finger, and with repeated practice a good degree of accuracy can be acquired.

Having examined all the samples, and discarded those which are too cloudy or too soft, there remain several which are apparently suitable in both particulars. These should be allowed to stand for a day or two and observations taken with regard to liquefaction. Other things being equal, preference should be given to the sample showing the slowest liquefaction.

Another point worthy of consideration is the thickness of the sheet, as a very thick sheet requires longer soaking and is more difficult to dissolve.

Recipes

Having obtained a suitable gelatine, we now come to the actual manufacture, and the following formulas will be found to give jellies of first-rate quality:

	A.	B.	C.	D.
Cane sugar ..	140 lb.	140 lb.	150 lb.	120 lb.
Glucose ..	28 lb.	56 lb.	42 lb.	56 lb.
Water ..	4 gal.	4 gal.	4 gal.	4 gal.
Gelatine ..	28 lb.	33 lb.	33 lb.	33 lb.
Citric acid ..	3 lb.	2½ lb.	2 lb.	2½ lb.

The amount of gelatine, however, may require slight modification, depending on the grade used and the setting power required in the jelly.

The gelatine to be used may be in the form of sheet, powder, or flake, and the following is the procedure in each case:

Types of Gelatine

Sheet.—The gelatine is placed in a vat, covered with water, and allowed to soak until it has absorbed about twice its own weight of water. This will take from 1½ to 5 hours, depending on the thickness of the sheet chosen.

Powder.—The gelatine should be mechanically mixed with twice its weight of water just long enough for the water to be fully absorbed. The time required varies slightly with the grist of the gelatine.

Flake.—This recently introduced form of gelatine has many advantages over both the sheet and the powder. It shares with powder the advantage of occupying much

A striking, yet simple, American package design. The label, well down on the tumbler, permits the jelly to make its own appeal.

less bulk than the sheet, with consequent diminution of storage space. Its principal advantage, however, is that a known quantity of water can be added and the gelatine allowed to soak without the danger of over-absorption of water as in the case of the sheet, or the necessity of mechanical mixing as with the powder.

Method of Manufacture

The sugar and the glucose are boiled up with 3 or 4 gal. of water to a temperature of 240° F., and the gelatine cautiously added with constant stirring. After the gelatine is completely dissolved, the colour, flavour, and acid are added. The batch should then be allowed to stand for a time so that the froth may rise, and it is then run off through a very fine sieve and poured into the moulds, there to set for about 1½ to 2 hours. Before pouring, the moulds should be smeared with slab oil, the excessive use of which is greatly to be deprecated, as many an otherwise excellent jelly is spoiled by the amount of oil left adhering to its surfaces. The oil used is greatly a matter of individual choice, but obviously it should be odourless, or practically so, and not too viscid. Petroleum oil and nut oil will be found to answer the purpose quite satisfactorily.

The jelly is now ready for the cutter, and here again only the minimum amount of lubricant should be used. The cutter should be kept scrupulously clean, and this is best accomplished by the frequent use of a steam jet. As a potential *source of mould* contamination, the cutter, owing to its comparative inaccessibility, is probably one of the likeliest, and extreme care should be taken to ensure cleanliness.

As a further precaution against mould, the jellies can be placed in a drying chamber and a current of warm, filtered air passed over them. A few hours will be sufficient to form the necessary protective skin, when they are ready for wrapping and cartoning.

This may be done by hand, but, in order to minimise the amount of handling and to have the jellies cartoned as speedily as possible, it is advisable, where the trade warrants, to use a wrapping machine.

The wrapping paper should be of good quality wax paper free from odour, as the offensive odour of a crude wax would certainly not improve the flavour of a table jelly.

Crystal Table Jellies

Crystal jellies, due probably to their simplicity of preparation, would appear to be gaining in favour with the public, but it is questionable whether they will ever displace their more stolid predecessor.

In course of manufacture fewer problems arise, but there are several points worthy of attention.

The grist of the gelatine used should approach as nearly as possible to that of the sugar, as a wide divergence in the size of the particles tends to cause separation of the constituents. Where this occurs in the packet the matter is one of little consequence, but it may happen that the separation takes place between the stages of mixing and packeting.

The colour solution should be of as high a concentration as possible to minimise the amount of water introduced into the batch.

Perhaps the greatest source of trouble is the caking of the contents of the packet. This is usually due to the product being packed while in a slightly damp condition or stored in a moist atmosphere.

Another probable cause of the trouble is the grist of the citric acid used. This should not be too finely powdered, but should be of approximately the same size as the sugar.

It may be found, too, that the substitution of tartaric acid for citric would minimise the trouble.

The following formula will give a jelly of good quality:

Sugar	120 lb.
Gelatine	20 lb.
Citric acid	3 lb.
Colour	q.s.
Flavour	q.s.

Here again the amount of gelatine will vary slightly with the grade used and the amount of acid can be modified as desired. The amount of colour and flavour are best determined by the manufacturer, as essences produced by different firms vary so greatly in strength.

The colour should be thoroughly mixed with the sugar before adding the gelatine. When this is completely mixed, the acid should be added and finally the flavour.

The batch should then be thoroughly dried before packeting.

While the foregoing does not by any means exhaust the subject, the points discussed may be of interest to manufacturers.

The formulæ submitted are sound commercial propositions, which, however, can be modified as desired, and the methods are the results of years of experience.

Some aspects of the manufacture of table jellies, showing how costs have been reduced by means of improved methods of handling, starting from the storage of glucose, soaking of gelatine, right through to improved wrapping and cartoning, will appear in "The Food Industries Weekly" *in the issue of September 7 and subsequent issues.*

VITAMIN STANDARDS and International Action

Mr. A. L. Bacharach, M.A., F.I.C., Chief Chemist at the Glaxo Laboratories, reports the findings of the League of Nations Vitamin Conference in a Supplementary Note to the article in our July issue.

IN FOOD MANUFACTURE for July I gave an account of the use of international standard preparations and international units for quantitatively expressing the vitamin contents of foods and pharmaceutical products. The object of my article was to indicate the position that would be found confronting the Permanent Commission on Biological Standardisation of the Health Organisation of the League of Nations when its Vitamin Conference met in London, as it was doing at approximately the time when the article was published. The Conference met for three days, and drew up a report that will in due course be presented to, and accepted by, the Permanent Commission itself. Meanwhile, a summary of the report has been officially published in the medical press, and it may be of some interest to readers of this journal for me to compare the findings of the Conference with my forecast published last month. This I propose to do by taking the vitamins in the same order as in my previous article.

Vitamin A

The present international standard, a specimen of impure carotene, consisting mostly of β-carotene, is to be replaced by a solution in coconut oil of the pure β-isomer. It has been found that this is more active than the international standard, and that 0·6γ of the new standard will be equivalent in activity to 1γ of the old. The purity of the new international standard preparation of β-carotene will be defined by its melting point, its optical activity, and so on, but it will be issued already dissolved in coconut oil, since various workers have found that β-carotene dissolved in this oil remains unchanged for a considerable period. The Conference also recommends the adoption of a "well tried sample of cod liver oil" as a secondary standard. This will involve the selection of a sample of cod liver oil, whose potency is reasonably high, and of which the stability may be expected to be good, as well as the assay of this sample of cod liver oil in terms of the international unit by various workers, and its subsequent storage for distribution. Some little time is likely to elapse before such a sample of oil is available, unless it is possible to obtain sufficient supplies of an oil that has already been standardised in the necessary manner.

It will be seen that the attempt to use as the new international standard preparation pure vitamin A, or something approaching it, has not been made, possibly owing to fears that very rich concentrates of the vitamin might not be sufficiently stable, or that the preparation of adequate supplies might prove difficult. Nevertheless, a very important principle is ceded in the report of the Conference, which recommends that it shall be permissible to assay by means of the spectroscope the vitamin A in liver oils and concentrates made from them. The intensity of the absorption band in the ultra-violet region at 328 mμ is accepted as being proportional to the amount of vitamin A present in substances of this class, and a factor will be given in the Commission's report enabling the percentage of vitamin A in a liver oil or concentrate to be quickly determined, provided other substances absorbing in the same region are absent, by purely physical methods, a procedure that has already been adopted as current practice in these laboratories for some years. When the biological activity, in international units, of pure vitamin A is defined by the Permanent Commission, it will then become possible to state the vitamin A content of a liver oil or concentrate in international units by a direct calculation from the spectrophotometric readings.

Vitamin D

It is a matter of some disappointment that the Conference has not recommended the adoption of calciferol for the international standard. Their reason for not doing this is that the present solution of irradiated ergosterol appears to have served its purpose very well, and that there are considerable supplies of it still available. The Conference has some interesting observations to make on

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less bulk than the sheet, with consequent diminution of storage space. Its principal advantage, however, is that a known quantity of water can be added and the gelatine allowed to soak without the danger of over-absorption of water as in the case of the sheet, or the necessity of mechanical mixing as with the powder.

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In course of manufacture fewer problems arise, but there are several points worthy of attention.

The grist of the gelatine used should approach as nearly as possible to that of the sugar, as a wide divergence in the size of the particles tends to cause separation of the constituents. Where this occurs in the packet the matter is one of little consequence, but it may happen that the separation takes place between the stages of mixing and packeting.

The colour solution should be of as high a concentration as possible to minimise the amount of water introduced into the batch.

Perhaps the greatest source of trouble is the caking of the contents of the packet. This is usually due to the product being packed while in a slightly damp condition or stored in a moist atmosphere.

Another probable cause of the trouble is the grist of the citric acid used. This should not be too finely powdered, but should be of approximately the same size as the sugar.

It may be found, too, that the substitution of tartaric acid for citric would minimise the trouble.

The following formula will give a jelly of good quality:

Sugar	120 lb.
Gelatine	20 lb.
Citric acid	3 lb.
Colour	q.s.
Flavour	q.s.

Here again the amount of gelatine will vary slightly with the grade used and the amount of acid can be modified as desired. The amount of colour and flavour are best determined by the manufacturer, as essences produced by different firms vary so greatly in strength.

The colour should be thoroughly mixed with the sugar before adding the gelatine. When this is completely mixed, the acid should be added and finally the flavour.

The batch should then be thoroughly dried before packeting.

While the foregoing does not by any means exhaust the subject, the points discussed may be of interest to manufacturers.

The formulæ submitted are sound commercial propositions, which, however, can be modified as desired, and the methods are the results of years of experience.

Some aspects of the manufacture of table jellies, showing how costs have been reduced by means of improved methods of handling, starting from the storage of glucose, soaking of gelatine, right through to improved wrapping and cartoning, will appear in "The Food Industries Weekly" *in the issue of September 7 and subsequent issues.*

VITAMIN STANDARDS and International Action

Mr. A. L. Bacharach, M.A., F.I.C., Chief Chemist at the Glaxo Laboratories, reports the findings of the League of Nations Vitamin Conference in a Supplementary Note to the article in our July issue.

IN FOOD MANUFACTURE for July I gave an account of the use of international standard preparations and international units for quantitatively expressing the vitamin contents of foods and pharmaceutical products. The object of my article was to indicate the position that would be found confronting the Permanent Commission on Biological Standardisation of the Health Organisation of the League of Nations when its Vitamin Conference met in London, as it was doing at approximately the time when the article was published. The Conference met for three days, and drew up a report that will in due course be presented to, and accepted by, the Permanent Commission itself. Meanwhile, a summary of the report has been officially published in the medical press, and it may be of some interest to readers of this journal for me to compare the findings of the Conference with my forecast published last month. This I propose to do by taking the vitamins in the same order as in my previous article.

Vitamin A

The present international standard, a specimen of impure carotene, consisting mostly of β-carotene, is to be replaced by a solution in coconut oil of the pure β-isomer. It has been found that this is more active than the international standard, and that 0·6γ of the new standard will be equivalent in activity to 1γ of the old. The purity of the new international standard preparation of β-carotene will be defined by its melting point, its optical activity, and so on, but it will be issued already dissolved in coconut oil, since various workers have found that β-carotene dissolved in this oil remains unchanged for a considerable period. The Conference also recommends the adoption of a "well tried sample of cod liver oil" as a secondary standard. This will involve the selection of a sample of cod liver oil, whose potency is reasonably high, and of which the stability may be expected to be good, as well as the assay of this sample of cod liver oil in terms of the international unit by various workers, and its subsequent storage for distribution. Some little time is likely to elapse before such a sample of oil is available, unless it is possible to obtain sufficient supplies of an oil that has already been standardised in the necessary manner.

It will be seen that the attempt to use as the new international standard preparation pure vitamin A, or something approaching it, has not been made, possibly owing to fears that very rich concentrates of the vitamin might not be sufficiently stable, or that the preparation of adequate supplies might prove difficult. Nevertheless, a very important principle is ceded in the report of the Conference, which recommends that it shall be permissible to assay by means of the spectroscope the vitamin A in liver oils and concentrates made from them. The intensity of the absorption band in the ultra-violet region at 328 mμ is accepted as being proportional to the amount of vitamin A present in substances of this class, and a factor will be given in the Commission's report enabling the percentage of vitamin A in a liver oil or concentrate to be quickly determined, provided other substances absorbing in the same region are absent, by purely physical methods, a procedure that has already been adopted as current practice in these laboratories for some years. When the biological activity, in international units, of pure vitamin A is defined by the Permanent Commission, it will then become possible to state the vitamin A content of a liver oil or concentrate in international units by a direct calculation from the spectrophotometric readings.

Vitamin D

It is a matter of some disappointment that the Conference has not recommended the adoption of calciferol for the international standard. Their reason for not doing this is that the present solution of irradiated ergosterol appears to have served its purpose very well, and that there are considerable supplies of it still available. The Conference has some interesting observations to make on

a curious phenomenon shown by vitamin D. Certain animals, for example the chicken, appear to require a much larger number of international units when this is administered as irradiated ergosterol or calciferol than when it is administered as cod liver oil. The result is that the Commission has found itself compelled to recommend that the description of a given amount of vitamin D in natural or manufactured products should not merely be in international units, but should have reference to the fact that the product has been standardised against the international standard on rats, or whatever animal has been used.

Whether cod liver oil supplies to the chick some factor besides vitamin D that is essential to cure its characteristic "leg weakness" or whether, as some workers maintain, cod liver oil contains a different antirachitic factor from calciferol, and possibly also from the antirachitic substance of butter fat, still remains to be settled.

None of these considerations, however, affects the relative merits of calciferol and irradiated ergosterol, since the antirachitic activity of the latter is universally accepted to be solely due to its content of the former. It is also rather ironical to reflect that the form of vitamin D principally used by the human subject to prevent and cure rickets and allied conditions is probably calciferol, since it is almost certain that the effect of ultra-violet irradiation, natural or synthetic, on the animal subject is to activate a sterol present in the skin and peripheral blood stream so that it may then be carried by the circulation to the sites of its physiological action. If indeed it should prove that the antirachitic substance of cod liver oil is different from calciferol, it may yet be correct to say that the use of calciferol is the more "natural" way of treating rickets than the use of cod liver oil, even though such an argument is not likely to cut much ice either way with enlightened practitioners.

Vitamin C

As forecast, the new international standard preparation is to be pure *l*-ascorbic acid, the purity being established in the usual way, by consideration of its physical and chemical properties. 1 mgm. of the pure standard is defined as containing 20 international units. From this it follows that 1 ml. of "standard" lemon juice must contain 0·5 mgm. of ascorbic acid, a figure distinctly below the average, but well within the limits found by my colleagues and myself in this laboratory, and by various investigators elsewhere. Since the average lemon may be taken to contain 50 ml. of juice, the average ascorbic acid content of a lemon may be taken as 25 mgm.

Vitamin B_1

As forecast in my article, no change is recommended in the use of this standard or unit.

Other Vitamins

There is no reference in the Committee's report to vitamin E, but there is some discussion of the possibility of using pure lactoflavin as the international standard for vitamin B_2. It appears, however, to have been felt that the time was premature for such a step, but it seems highly probable that the next meeting of the Conference will be in a position to make some positive recommendation on this matter.

MILK IN BREAD?

(Continued from page 322.)

As is well known to research workers, there are so many variables to be considered in connection with the type of ingredients used, the process, fermentation, and baking of bread, that no hard and fast rule can be laid down as applying to every condition, so the illustration used is solely indicative of what has been found by research and supported by general commercial practice, and is not intended to apply to every condition any more than the formula set out would be recommended in every case.

In conclusion, let me assure Mr. Thomas that the baker himself, endeavouring to produce a finer and more nourishing product, has blazed the trail to milk in bread, and the dairy industry, following his lead, has devised better and more economical forms of milk solids for his use.

Instead of not caring in the slightest whether milk helps the baker or not, the dairy industry conducts extensive scientific and practical research in every branch of the baking art, in order to render to the baking trade the fullest measure of service toward the advancement of bakery interests.

Repeat Orders Testify . . .

To the Publishers.

July 6th, 1934.

DEAR SIRS,

I am enclosing the order for your paper for another year. I look forward to FOOD MANUFACTURE and enjoy the contents. I only wish those advertising in it would reply to enquiries sent. The lack of courtesy is in sharp contrast to the treatment given by American manufacturers, who never fail to reply even when they cannot be of any assistance. However, the fault is not yours, for I fully appreciate the valuable information you have given from time to time and the courtesy always shown.

Thanking you, and with best wishes,

Yours faithfully,

(*Signed*) NEWMAN C. BOYD.

157, CAMPBELL ROAD,
ONE TREE HILL,
AUCKLAND, S.E. 4,
NEW ZEALAND.

A whole cacao pod beside another split to show the beans with their surrounding bed of pulp.

The Preparation of CACAO

AS PART of an investigation into the changes taking place in foodstuffs, R. Whymper has studied the preparation of cacao. Some interesting points have been brought out by this work.

During the course of normal fermentation under the conditions of the experiments, an increase of temperature was noted, amounting to 20° to 25° for the first 72 hours, and in the same period the moisture content of the beans diminished. Between 72 and 144 hours, with the mass kept well mixed to prevent local overheating, the temperature fell from 50° to 40°, and at the same time the beans re-absorbed moisture. These moisture relations are liable to slight fluctuations on account of variations in the permeability of the integument.

Fermentation of the integuments and pulp for six days caused an increase in *p*H from 3·6 to about 6·5, whereas the kernels underwent a smaller, but definite, decrease.

When fermentation is carried to the limit, the *p*H of the kernels becomes the same as that of the integuments and pulp.

The modifications undergone by the colouring matter of cacao during fermentation have been studied by means of ferric chloride paper and uranium acetate paper; these chemicals were chosen for their colour reactions with tannins. The red coloration given by a drop of the aqueous extract from fresh kernels of Calabacillo cacao on ferric chloride paper is always accompanied by a bluish tint; the resulting purplish colour is very readily distinguished from the unadulterated red given by true Forastero cacao treated in the same way, while Criollo cacao gives a pale rose colour, and certain varieties of white speckled cacao give no red coloration at all.

Fermentation was followed for six days (144 hours) by means of ferric chloride paper; the red zone surrounding the central spot, strongly marked due to tannins, weakened from intense purple to very pale rose on the sixth day in the case of Calabacillo. Progressive disappearance of tannins was noted also in the kernels.

Results with uranium acetate paper were very inconsistent, but it was established that the temperature at which the extracts were prepared played a very important part in determining the coloration obtained with this reagent.

The evidence of absorption spectra leads to the conclusion that the red coloration obtained with fresh Calabacillo cacao beans is due in large part to an acid derivative of phloroglucinol-pentosan.

Pyrogallic tannins and gallic acid were not found in fresh Calabacillo or Forastero cacaos, but a positive reaction was obtained for pyrocatechol.

Periodic testing from day to day during the course of fermentation has shown that a steady migration of tannins goes on from the kernels to the integuments.

The production, during the fermentation process, of undesirable substances and moulds (in the case of fermentation carried to the limit) has also been studied. Liberation of ammonia occurred at the stage when mouldiness set in, and the formation of amines from ammonium acetate seems to offer an explanation of the undesirable characteristics of the beans.

TRUE FRUIT FLAVOURS

By Harold Morgan

CONCRETE AND absolute extracts are obtainable in the perfumery world. Why are their equivalents not marketed in the flavouring industry? This, in brief, is the subject of a recently published German paper advocating immediate investigation into the preparation of natural fruit oils.

The matter certainly is one of importance for, as I have mentioned on previous occasions, our synthetic blends are still a long way from being perfect representations of the particular fruit flavours they are intended to portray. Isolation of the essential aroma-producing substances will be of valuable assistance in indicating the aromatic chemicals which actually form the flavours.

These natural fruit oils possess several advantages, among which may be mentioned their extreme concentration and therefore small volume, and the absence of substances which interfere with or mar the keeping qualities of the flavour. The instability of ordinary fruit juices is an excellent illustration of the latter drawback.

Flavour development in fruits has been studied and a fairly accurate picture of what occurs in plants can be formed. Under the influence of the life-giving sun, chlorophyll is produced in the first place and this forms the basis of subsequently synthesised nutrient and structural products. Chief among the latter is sugar, followed by starch, and finally by fibrous materials. As the growing process is intensified, the tannins and glucosides appear, but at this stage very little of the aromatic substances is produced.

The initial products built up in plants are remarkable for their complexity—*e.g.*, polysaccharides, glucosides, anthocyanins, alkaloids. Subsequent development of aroma is accompanied by degradation into simpler compounds.

Plants, being living organisms, excrete various metabolic waste substances, and these are actually the aroma compounds. Maximum activity in the production of odoriferous compounds occurs during blossom time and thus insects are attracted for propagation. Odour decreases during the formation of the fruit, but as the latter ripens, more aromatic substances are produced which render the ripe fruit palatable and attractive to animals.

Fruit aroma substances accumulate in relatively high concentration, below the skin for the most part, this region being exceptionally rich in glucosides in the period preceding maturity. Chemically the flavour constituents are similar to those isolated from flowers, and are composed of mixtures of esters, alcohols, aldehydes, ketones, oxides, terpenes, and occasionally nitrogenous substances.

The essential oils have been extensively examined and many references in literature appear regarding their constituent flavouring materials. Publications relating to fruit oils are, however, scanty, but some information has been obtained in certain instances.

Pineapple fruit oil, as extracted from the sterilised juice of Cuban fruit, is a dark-coloured liquid. It gives off a powerful odour of capronic origin, and among the substances which have been detected are ethyl butyrate, amyl acetate, amyl butyrate, and acetaldehyde.

Apple oil has been found to contain acetaldehyde, amyl formate, acetate, and other amyl esters. Nerol in ester combination is also probably present.

Study of banana oil has led to the isolation of amyl acetate and acetaldehyde.

The principal constituent of pear oil, as is well known, is amyl acetate, and there are traces of other substances which modify and give a distinctive note to this powerfully aromatic chemical.

Strawberry oil has a strong phenolic smell, while raspberry oil has a distinctly fragrant odour. Identification of some of the constituent chemicals has been of great assistance in matching these flavours.

Currant oil, cherry oil, peach oil, apricot oil, plum oil, and gooseberry oil have all been prepared and certain constituent chemicals identified in each case. As mentioned above, a considerable amount of work has been done on the essential oils.

The commercial production of fruit oils will be welcomed in all industries requiring flavours which really do give the aroma and taste of the fruits themselves. Their concentration is so intense that the strength can be regulated to meet the conditions of the trade at economic prices and investigations are now being carried out with these objects in view.

Industrial News

B.S.I. ANNUAL MEETING—POWDERED FLAVOURS—EAST AFRICAN FOOD IMPORTS—BUSH SPORTS MEETING—ALUMINIUM FOOD PLANT—TITANIUM DEVELOPMENTS—CONTAINER TRANSPORT—PROGRESS IN METAL WORK

Exhibition of Sweets

The Annual Chocolate and Confectionery Exhibition is now being held at the Empire Hall, Olympia, having been opened on August 29 for a period of one week.

There is the usual arrangement of stands, with machinery, bottle manufacturers, etc., on the ground floor, the first and second floors being devoted to the stands of the various manufacturing confectioners, showing boiled sweets, confectionery of all sorts, chocolate, etc.

No Window Display Competition is being held this year, but various addresses are being given on subjects of interest to the trade, especially from the point of view of window display. In addition, various trade organisations are holding meetings during this week.

The very high standard set in previous years is fully maintained this year; various special lines are being exhibited for the first time, and it is noticeable that retail prices are now more in keeping with the cost of living.

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Company Change

Messrs. Henry W. Peabody and Co. of London inform us that from August 8, 1934, the business hitherto carried on by their firm will be conducted as a private Company under the name of Henry W. Peabody and Company of London, Ltd. The Directors of the Company will be: Percy Lionel Cohen (Chairman), Robert Adolphus George Tilney, Seaverns Andrew Cohen, John Douglas Hibberd, Frederick Herbert Small, David James Ferguson, and Charlie Henry Benmore.

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B.S.I. Annual Meeting

At the Annual Meeting of the British Standards Institution held a short time ago, Dr. E. F. Armstrong, F.R.S., was elected to succeed Mr. E. J. Elford as Chairman of the General Council.

The report of the work carried out by the Institution during the past year shows all-round progress and a considerable expansion. It must be remembered that the B.S.I. now deals with practically any industrial standardisation that the various branches of industry call upon it to undertake.

In the Chemical work an important matter of interest to readers of this journal is the setting up of machinery for the development of Dairy Standards. At the request of the Imperial Agricultural Bureau, a Technical Committee has been appointed to take over and continue the work of the Dairy Research Committee of the Empire Marketing Board, and to deal with any further standardisation work which may be shown to be desirable in the interest of the Dairy Industry. Four Sub-Committees are dealing with Volumetric Glassware, Freezing Point of Milk, Chemical Analysis, and Bacteriological Technique.

Other work bearing on food and related industries is being done by the B.S.I.: specifications for methods of sampling Vegetable Oils and Fats both in packages and in bulk are in course of preparation, and three draft specifications for Aluminium and Aluminium Alloys have been completed for submission to the Industry Committee.

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Powdered Flavours

Most readers will recollect an important article on the manufacture of Ice Cream Powders which we published in the June issue. In the course of this article, under the heading of "Flavours", the author remarked that it is extremely difficult to obtain a true, natural flavour in a powdered form. It is just possible that some of our readers may take this as indicating that this difficulty has prevented the production of powders having a true, natural flavour. In order to obviate any such possibility, the author of the article wishes to make it clear that there is at least one range of flavour powders—namely, the "Drydex" Flavours manufactured by Messrs. A. Boake, Roberts and Co., Ltd.—which are eminently satisfactory for imparting a true, natural flavour to such products as ice cream powders. It should be added that the author has no connection with the firm in question.

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Slicing Machinery

A new dicing and slicing machine has been brought out by Messrs. Lazenby and Ridgwell, Ltd. This is fully automatic, and designed to deal with large quantities. It will dice or slice root vegetables, apples, etc., producing an exceptionally accurate and clean cut.

To give some figures, capacity per hour = approx. 3 to 4 tons; pulley wheel dimensions 19¾ in. × 3 in.; revs. per min. = 180; power consumption = approx. 3 h.p.; case dimensions 4½ ft. × 4¼ ft. × 2¼ ft.

Dicing and Slicing Machine.

East African Food Imports

The Department of Overseas Trade has issued a report by His Majesty's Trade Commissioner in East Africa, entitled "Economic Conditions in East Africa" (April, 1932 to March, 1934). The report tends to show that there is good reason to believe that the worst of the depression has been passed and that business conditions are moving in a favourable direction.

The report discusses finance questions in some detail, including public finance and credit conditions. In the trade chapter imports and exports are dealt with commodity by commodity, while the question of competition in imports is considered. Other chapters are included on Legislation and Transport, while the report concludes with appendices giving statistics of trade and shipping, and an Annex dealing with the Somaliland Protectorate.

Total imports in the class *Food, Drink, and Tobacco* amounted to £1,731,208 in 1933 compared with £1,778,246 in 1932. These figures suggest that the slight reduction which has occurred may easily be accounted for by reductions in prices generally, and that expanding local production of foodstuffs is doing no more than meeting a natural increase in the consuming capacity of the East African peoples.

Import figures for *biscuits* and *confectionery* are given in the following table:

	1931.	1932.	1933.
	Cwt.	Cwt.	Cwt.
	[illegible]	[illegible]	[illegible]
United Kingdom and Irish Free State	[illegible]	[illegible]	1,473
	[illegible]	[illegible]	80
	[illegible]	[illegible]	[illegible]
	£	£	£
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]

As regards biscuits, cheap products of Dutch origin have largely been ousted. Germany has regained trade mainly in the coastal districts with, in some cases, low-priced imitations of U.K. goods.

In miscellaneous confectionery the U.K. has virtually maintained its predominant position, the loss being accounted for by imports of the very cheapest varieties from Holland and, in a smaller degree, from the Soviet Union. The local manufacture of chocolates and boiled sweets is increasing in Kenya Colony and in certain cases considerations of lower price, but comparable quality, will doubtless assist local industry against importations.

Bush Sports Meeting

On Saturday, July 28, we had the pleasure of attending the tenth annual athletic sports meeting of Messrs. W. J. Bush and Co., Ltd., at the Leyton football ground. The weather was lovely and there must have been over 1,500 visitors watching the keenly contested events. "Entractes" from a gramophone-loudspeaker equipment were much appreciated, as were the excellent catering arrangements; the use of a microphone for making the various announcements was a great improvement on the traditional megaphone.

Space will not allow details of all the results, but, to mention a few, the Relay Race was easily won by the Office, who ran very well; the One Mile Handicap was won in fine style in 5 min. 8 sec. by the only scratch runner out of ten starters. The Tilting-the-Bucket Race was patriotically cancelled as the Organisers did not wish to give Lord Desborough a sleepless night! The Children's Races (for employees' children under 10 years of age) caused a great deal of amusement and provided numerous "false starts". The Stewards' Race, which was run in two heats and a final, gave a fitting termination to the meeting. There was an unfortunate misunderstanding in the second heat of this race; as the start was given, the impressive figure of one of the Stewards, who had been "spotted" as a likely winner, was seen to be running vigorously in a direction opposite to that taken by the others. Although he stoutly maintained afterwards that the others were all wrong, and ought to be disqualified, the majority had their way. This event was won by the Chairman's son, Mr. E. L. Bush. His prize was a bottle of grapefruit crush!

There was a splendid collection of prizes, among which we saw several umbrellas; perhaps this was not without some relation to last year's meeting, which the Chief Steward informed us was held in pouring rain! The prize for the Veteran's Race, a handsome and capacious tankard, was won by a lifelong teetotaller; he also won a box of cigarettes for another event, but he is a non-smoker as well!

The prizes were presented by Mrs. H. Brinsley Bush, followed by a short address from the Chairman, Mr. James M. Bush. Dancing concluded a most enjoyable afternoon.

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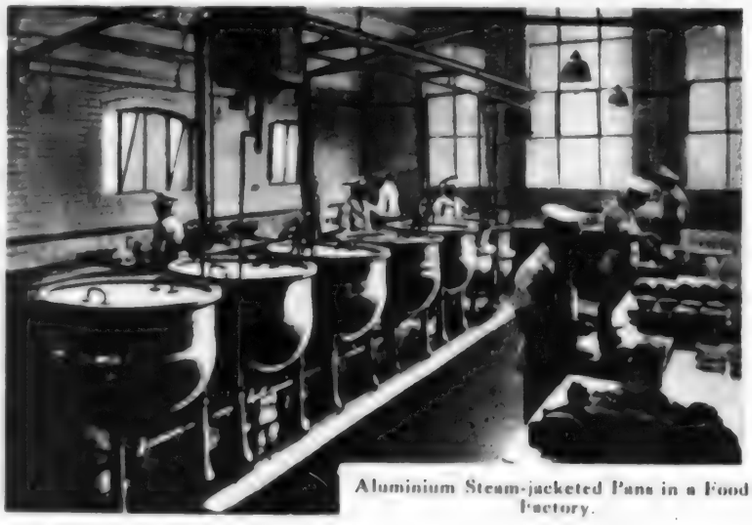
Aluminium Food Plant

A publication entitled "Aluminium Production, Properties, and Applications", produced by The British Aluminium Co., Ltd., shows very clearly the astonishing diversity of uses to which the metal is put in industry to-day. It is lavishly and very effectively illustrated, and gives quite a remarkable "bird's-eye view" of aluminium. To take a few examples from the large number available, an 18-ft. aluminium canoe weighs only 35 lb.; a motor cruiser hull and a streamlined American express railcar are built of aluminium alloy throughout; modern bus and lorry construction are shown to benefit largely from the weight-saving obtained by using aluminium; a 2,000-gal. milk transport tank utilises aluminium foil for heat insulation; the metal is being increasingly employed for interior decoration, and the use of the metal in powder form as a paint pigment is rapidly extending.

Our illustration shows the interior of a preserved provision factory, where all steam-jacketed pans are of aluminium, and the frames of the tables of "Alpax", an aluminium alloy made by the Aluminium Plant and Vessel Co., Ltd.



Aluminium Steam-jacketed Pans in a Food Factory.

Titanium Developments

On July 9, 1934, Sir Robert Horne opened the new factory of the British Titan Products Co., Ltd., at Billingham, and filled the first cask of titanium dioxide pigment.

It is possibly due to their inertness that titanium pigments are non-poisonous, a requirement of obvious importance in the many pigmented articles which come into contact with foods. Titanium dioxide is being used as the filler in rubber rings for food containers, and in addition to its non-toxic nature, greatly improves the appearance on account of its exceptionally high degree of whiteness. The Company's Development Department is designed and equipped to attack new problems which may arise in connection with the extension of the uses of this important pigment.

Our illustrations show a general view of the new factory from the south-west, and a mill used for grinding ilmenite, the ore from which the pigment is made.

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Container Transport

The container method of transport, introduced by the L.M.S. in 1927, has proved an undoubted success. These vehicles are increasingly employed for the conveyance of all kinds of commodities—anything from butter to bicycles. Their popularity lies in the extremely safe and expeditious service they offer. The container is taken by rail and road right to the customer's premises, where the contents can be unloaded, which incidentally is the first handling the commodity has received since it left the manufacturer. Containers are conveyed on express freight trains, ensuring speedy delivery.

The demand for these containers is so great that the L.M.S. Company is making provision for the future by building an adequate stock so that there shall be no shortage in the supply.

L.M.S. warehouses, of which there are 330, located at the principal centres of population, are proving a useful aid to marketing, in that they enable the trader or manufacturer to keep a supply of goods in close proximity to his market. Delivery from bulk can be effected as and when required either by the customer's own staff or by L.M.S. staff, the charges being at a very low rate. Apart from the storage of goods and merchandise, L.M.S. warehouses are successfully filling the job of offices, showrooms, pattern rooms, etc. Any size of space can be reserved for a minimum of £3 5s. in the provinces and £6 in London.

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Progress in Metal Work

Sixty years ago Mr. G. A. Harvey started in business for himself by acquiring an old forge in Lewisham. This he converted into a workshop, and, with the assistance of one boy, carried on the business of a zinc worker, to which trade he had been apprenticed. This nucleus of a works occupied less than half an acre of ground, and the production consisted mainly of materials in zinc—cistern linings, guttering, etc., for the requirements of local builders. All its early history was shaped by the personality, character, and driving energy of the one individual.

To-day the up-to-date works of Messrs. G. A. Harvey and Co. (London), Ltd., extend over 28 acres, and the firm's many-sided industrial activities and thousands of customers at home and overseas testify to the manner in which their ideas have progressed with the times, while at the same time the traditions built up in the early days have been maintained.

Messrs. Harvey are really in a class by themselves; it would be inadequate to describe them simply as engineers or as metal workers, for they manufacture for a great variety of trades and an even greater variety of purposes.

To indicate the wide field which they cover, we might mention the production of fine wire cloth in several different metals, thicker wire meshes, perforated metals in every conceivable shape and size of perforation, patent ventilators, ordinary domestic dustbins, steel furniture, garage equipment, etc.; also the building of heavy industrial plant, such as pressure vessels, distillation plant, fractionating towers, reaction vessels, vacuum driers, digesters, autoclaves, jacketed pans, food processing retorts, etc. There are special departments for engineering, galvanising, metal perforating, tank work, steel plate working, welding, wire-working, etc.

Effective co-operation between the firm and their employees has resulted in mutual goodwill which is itself a great aid to industrial efficiency.

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Part of the Grinding Equipment at the new Titanium Factory at Billingham.

RECENT PATENTS (Continued from page 336.)

necessity for drying before roasting. Example: 1,000 kgm. of raw coffee beans are agitated at atmospheric or higher temperature in a closed rotating drum for some time in presence of 10 litres of atomised 35 per cent. formaldehyde. After maintaining in the closed drum at the ordinary temperature for several days with only occasional shaking, the contents can be roasted without preliminary drying.

409,790. **Meat, etc., preparations.** Lunt, W. R. F., 330, Smith Street, Durban, South Africa.

In treating meat and other foodstuffs with papain, the papain in aqueous solution is incorporated in a suitable carrier which can readily be applied to the food. The papain solution may be added to lint or other absorbent fabric, which is then dried and is moistened before use, or may alternatively be added to gelatine to form a jelly, which is brushed on to the food.

410,834. **Inhibiting colour changes in vegetable oils and fats.** Mantle Lamp Company of America. (Convention date, U.S.A., August 20, 1931.)

To prevent development of undesirable colour in treated fats when exposed to light and heat it is proposed to incorporate during the treating process a minute amount of certain metals or their salts. Not more than 0·05 per cent. of the metal ingredient is specified and copper carbonate is particularly recommended. The metallic component may nevertheless be selected from a very wide range, which includes carbonates of cobalt(ous), lithium, manganese and cadmium, certain hydrates, colloidal cobalt, cadmium and silver. Although many of these substances have the effect of imparting pronounced colour when incorporated with the fat in high proportion, the addition of less than 0·05 per cent. not only results in a colourless end-product, but also stabilises the fat against later colour changes.

INFORMATION and ADVICE

Diabetic Biscuits—Saccharin—Cake Filling—Desiccated Coconut — Marzipan — Arrowroot — Condensed Milk — Marmalade — Synthetic Honey — Lemon Curd—Preserving Jellies—Drying Lemon Peel—Maraschino Cherries—Strawberries in SO_2

Diabetic Biscuits

1,645. (1) *Can saccharin be used in a diabetic biscuit? If not, why not?* (2) *Can bran be used? If not, why not?* (3) *Can malt extract be used? If not, why not? Can you possibly oblige us with a formula or give us a rough idea of a diabetic biscuit?* (England.)

It is always a difficult matter to draw a line between a diabetic food and what might be called a semi-diabetic food, because there are those patients who are so advanced that they are unable to tolerate the least quantity of sugar or carbohydrate and those who are able to tolerate quite a substantial amount. Hence the regulation of the diet is really determined by the class to which the patient belongs. This means that one can allow a certain degree of tolerance in the carbohydrate content of diabetic biscuits as regards average patients. It need not be necessary to omit carbohydrate altogether. Thus two out of three of your questions really depend on how much of the ingredients you intend to use.

In the case of saccharin, this is frequently used to replace sugar as a flavour, chiefly for diabetic, gouty, and obese patients.

As regards bran, as this consists largely of cellulose and, apart from mineral matter, is deficient in nutriment, I cannot see that its inclusion would serve any useful purpose. On the other hand, there is no particular reason, as far as I know, why it should not be used, provided the quantities are not excessive.

You will see from what I am quoting below, the views of Dr. Robert Hutchison on the question of the composition of diabetic cereal foods.

"*Diabetic Breads.* In recent times a large variety of breads have been specially devised for the use of diabetics. For the most part these are compounded of eggs, along with some vegetable substance more or less free from starch. Of such substances, gluten, the chief proteid of wheat, was one of the first to be employed, but more recently the oily nuts (such as the almond, cocoa-nut, and hazel nut), bran, and the soja bean, have also been pressed into service. Of these products it may be remarked, in the first place, that many of them, and this applies specially to the gluten breads, are by no means free from starch; while in the case of others the chief ingredient is cellulose, which, of course, yields no nutriment to the body. Indeed, the only really valuable substance which they contain is fat, of which the bread may be regarded as a carrier. This is specially true of the almond and nut breads. Bran, being incapable of digestion in the human intestine, can serve no other purpose than that of adding to the bulk of the diet. This fact, that the greater part of many diabetic breads is composed of wholly non-nutritive matter, has not, I think, received the attention which it deserves. In addition to these objections one may say of all 'diabetic breads' that they are very expensive, and of most of them that they are extremely unpalatable and that patients quickly tire of them. In recent times casein has been adopted as a basis for diabetic breads. Protene Diabetic Bread, Casoid Bread, and Casoid Meal Bread are examples, and are entirely free from carbohydrates besides being fairly palatable. It may be well to point out here that the widely-spread belief that toast is less harmful to diabetics than bread is quite erroneous. Weight for weight toast contains more starch than bread and is therefore more instead of less harmful than the latter."

With regard to malt extract, as this consists roughly of about 65 per cent. of reducing sugars, it seems that it should certainly not be included in a diabetic food, at any rate not in quantities which will give more than a very small percentage of carbohydrate for the final product. On the other hand, amounts sufficient merely to impart a flavour would not be a disadvantage.

This brings up the question as to what difference in tolerance, if any, a diabetic patient shows towards different forms of sugar—*e.g.*, glucose, levulose, malt sugar, cane sugar. I have heard it stated that malt extract of high diastatic value is beneficial in diabetic foods.

Saccharin

1,646. *What regulations govern the use of saccharin in the manufacture of foodstuffs?* (Ireland.)

Information was furnished.

Cake Filling

1,647. *Required: A satisfactory method for making an artificial cream filling for cakes, buns, etc. The fat*

content should be about 40 per cent. Please include any formulæ you have and notes as to type of machines wanted to make it. (Surrey.)

Information was supplied.

Desiccated Coconut

1,648. *Please give full details of how desiccated coconut is made.* (London.)

Nuts to be used for making desiccated coconut should not be husked until a few days before they are wanted in the factory; they ripen in the husk, and if removed are liable to crack. When ripe, the nuts are picked over by skilled sorters, and only ripe, unblemished nuts delivered into the factory, where the shells are removed. During this process some unsound nuts are certain to be found in spite of the initial sorting, and it is essential that these be rejected. The kernel is decorticated by means of spokeshaves, the parings being removed to a separate drier and eventually converted into coconut oil and cake.

The pared nuts are at once placed in long concrete tanks lined with white tiles and supplied with constantly running water. This must be done quickly in order to avoid oxidation. It is of the utmost importance that there should be available plenty of pure water. Blemishes, dirt marks, small pieces of parings, etc., are removed at this stage, and the nuts are cut to the correct size and shape for the slicer machine, to which they are taken in wicker baskets, from which the water is able to run quickly. It is very important that the cutting knives should be as sharp as possible in order to tear apart the minimum number of oil cells, as otherwise bruising and bad colour of product result. The sliced nut falls into wooden or iron boxes made so that water can run away at the bottom; as soon as these are full they are taken to hot-air driers.

Trays about 3 ft. 6 in. square by about 2½ in. deep, having galvanised wire mesh bottoms, are used for the drying; they hold about 20 lb. to 25 lb. of material, which enters the desiccators heated to 180° to 200° F. 180° F. is considered to be the critical temperature for certain enzymes. Drying goes on for 45 minutes, and then the dried material is spread out on wooden tables for cooking and inspection before being sifted and packed. Moisture content is generally reduced to 2 to 3 per cent. to keep down discoloration and rancidity during transit to market. The hygrometric state of the atmosphere must be determined at intervals, and the time and temperature in the desiccators related to this. A point which is often overlooked is that the moisture content of the goods will, of course, vary with the size, the finer cuts containing less moisture.

Temperature and hygroscopicity of the atmosphere must be watched during packing, as the material must not be allowed to absorb moisture during this operation. The goods should be handled as little as possible, and the packing evenly done to avoid lumpiness; a press is frequently employed, whereby a high density of product in the case is obtained. Seamless plywood boxes are very suitable, and paper, aluminium, or lead linings are employed according to the market to which the goods are to be sent.

The most important points to observe, and these are frequently overlooked, are:

(1) Care in the original selection of the nuts; (2) prompt immersion of the pared nuts in clean water, which should be abundant; (3) minimum of delay between removing the nuts from the tank and introduction into the drier; (4) temperature in the drier not less than 180° F.; (5) cooling to the correct temperature before packing; (6) speedy and efficient packing, with the exclusion of light, gases, and moisture.

Marzipan

1,649. *What is the reason for developing mould growth in marzipan?* (Lancs.)

This is a question of preventing infection of the product by mould spores. Just at what point in your operations infection takes place it is impossible for me to say without actually following your procedure on the spot.

I cannot do better than to refer you to the article which appeared in our January, 1932, issue, from which I am making the extract given below.

There is also a good chapter dealing with this in Scarborough's book, *Sweet Manufacture*.

You really cannot do more than to keep all the utensils perfectly clean and dry. Use only the best raw materials free from spoilage and minimise air spaces in the final product.

The well-known marzipan boxes, holding generally 28 lb., consist of resin-free pinewood that is odourless and well dried. The edges of the boxes should be faced with zinc, so as to enable them to withstand the very considerable pressure applied in filling. The boxes are lined with salicyl-parchment paper, and they are weighed before being filled, so that the net weight required by the trade can be exactly controlled for each individual box. The filling operation is another highly important factor determining the quality of the goods. The problem here is to eject the mass so energetically and accurately from the roasting pan into the boxes that no air cavities are produced anywhere and all corners are completely filled up. Only this will serve to ensure that the mass, which rapidly solidifies in the boxes, will form a compact rectangular block with smooth surface, for rough surfaces tend to promote drying and crust-formation, and so render the marzipan mass of no value from the confectioners' and bakers' standpoint.

For similar reasons, the so-called "mirror" of the surface of the marzipan is of supreme importance. A perfectly smooth and entirely flawless mirror forms the best protection from the external effects of moisture and dryness, as well as from mould, fungi, and other micro-organisms carried by the atmosphere. Manufacturing firms of good standing, whose names constitute a guarantee of exceptional quality, are in the habit of embossing their names or trade-marks in the "mirror" with a wooden die, so as to relieve their customers of any suspicion that their goods have been mixed with other qualities. The packed marzipan boxes are then usually allowed to stand open for several hours in some chamber or space, specially prepared for the purpose, so

as to permit the mass to settle down until each individual box may, before being sent off, be again tested as to its fitness for transport and more particularly its resistance and consistency, thus enabling various qualities to be sorted out so as to meet the wishes of their customers.

Arrowroot

1,650. *Kindly supply information on the grinding of arrowroot into flour.* (Midlands.)

The first step in the factory operations is the soaking of the roots in water, to soften the adhering soil and the fibrous covering. The covering is then stripped off and the roots are again washed. The skin is said to contain a resinous substance which gives a yellowish colour and an unpleasant flavour to the starch if the latter is not well washed. The roots were formerly skinned with knives of German silver, and pulped in roller mills, but the former tedious operation has now been discontinued, and the pulping is carried out with rasping machines like those employed for potatoes. The fibrous character of the pulp is apt to cause the latter to collect in lumps if mechanical washing-out apparatus is employed, so it is usual to wash the pulp by hand in a current of water, in a perforated box. The starch suspension which passes through the perforations is conducted through a series of wire-gauze sieves, the first having a mesh of 40, the second 80, and the last 100 to the inch. The starch is deposited in glazed vats, again mixed with water and passed through a fine sieve, and finally deposited in small, round, galvanised iron cisterns. The deposited starch cake is freed from discoloured surface layers, drained for twelve hours on trays, and then broken into lumps and dried on wire screens in a building open to the air, but protected from birds, etc., by wire netting. The starch crumbles as it dries, and is obtained finally in a fine granular state containing 14 to 17 per cent. of moisture. The drying process occupies three to four days in hot weather, but in cold, wet weather a fortnight may be necessary, and in this case the starch is very liable to become sour and discoloured. The average yield of air-dried arrowroot is about 19 per cent. of the weight of the roots worked, corresponding to about 22 cwt. of arrowroot per acre.

Condensed Milk

1,651. *As subscribers to* FOOD MANUFACTURE, *we shall be glad if you will advise us regarding full-cream condensed milk that has turned hard in tins through being in stock for too long a time in our warm climate. We would like to know by what process we can get the hardened milk brought back to its liquid condition.* (South America.)

The thickening of sweetened condensed milk on storing at a high temperature may be due either to bacterial action, or to physical changes in certain of the constituents.

The former type—which, of course, should not occur in a properly prepared product—usually consists of an uneven clotting of the milk, and is frequently accompanied by an acid flavour. With this form of deterioration it is impossible to recover the fluid consistency.

With the physical type of thickening, however, unless this has proceeded to the point of solidity, the body can be broken down by very vigorous stirring. If the change is not too advanced it is usually possible to bring the milk to a fluid condition.

Marmalade

1,652. (1) *Where can we obtain Angelica seed?* (2) *Please supply recipes for marmalades.* (New Zealand.)

Information was supplied.

Synthetic Honey

1,653. *Can you give us any information concerning the preparation of artificial honey?* (London.)

So-called artificial honey has, or at least had, a large sale. A German specification (1921) runs thus: "It must be labelled artificial honey, have a good flavour and keeping qualities, and must not contain more than 3 per cent. of ash, 20 per cent. of starch syrup, 25 per cent. cane sugar, and 22 per cent. of water. It must give a strong reaction with Fiehe's test."

Artificial honey is usually made from manufactured invert sugar, which contains certain decomposition products which give Fiehe's test.

Since natural honey contains about 20 per cent. of water and 75 per cent. of a roughly equal mixture of levulose and dextrose (invert sugar) there is no difficulty in matching this part of its composition. The other 5 per cent. is made up of substances which do not materially affect the character of the honey, such as cane sugar, mannite, wax, pollen, and mineral matter. It has been stated that the ratio levulose: dextrose in genuine honey is 106-119: 100, whereas in artificial honey it is less than 90: 100. In any case, if a "true" synthetic honey is aimed at, there is no difficulty in this part of the composition.

Where the serious difficulty does arise is in respect of reproducing the flavour of honey, which is due to the presence of small amounts of volatile substances derived from the flowers, backed up probably by minute quantities of alcohol. It all depends how close you want to get to the true honey flavour; if only approximately then it is a relatively simple matter, but if the reproduction is to be "true to life" then the services of a specialist on flavour compounding are called for.

Blyth and Cox instance what they call "a curiosity of food" from America, which is an artificial honey composed entirely of glucose syrup, while the comb is artificial and made of paraffin wax.

Lemon Curd

1,654. *I will be thankful if you will be good enough to let me have complete working trial recipes for the manufacture on a commercial scale of lemon curd and fruit mincemeat.* (South Africa.)

Recipes supplied.

Preserving Jellies

1,655. *Could you inform me whether acetic acid may be used either in place of or together with citric acid for preserving jellies?* (Midlands.)

Acetic acid can be used with or without citric acid, but citric acid appears to favour the growth of mould, and for this reason it is better to use tartaric acid. One might use, for instance, 7 lb. of gelatin and 8 fl. oz. of 33 per cent. solution of acetic acid. Another mixing is 14 lb. dry gelatin, 6 fl. oz. 80 per cent. acetic acid, and finish with tartaric acid.

Drying Lemon Peel

1,656. *We should be glad if you can give us any information about the drying of lemon peel, especially with regard to any special precautions to be observed to avoid damage to the product.* (Manchester.)

I am afraid I cannot do more than offer one or two general suggestions about this matter.

The first is temperature. The drying should be as low as possible in order to minimise loss and chemical change of flavouring oils. It will be quite impossible, of course, to avoid some loss or change of the more volatile constituents.

In order to facilitate drying, it is usual to chop up the peel in a special type of machine. Mr. Heid, one of the chemists of the Bureau of Chemistry and Soils, U.S. Department of Agriculture, Los Angeles, California, recommends chopping to a maximum size of $\frac{3}{8}$ inch, and he says that it has been experimentally demonstrated that this fine disintegration produces satisfactory results.

The other point, of course, is to keep the peel from coming into contact with iron, otherwise darkening will result. Stainless steel trays will probably be found suitable.

I should imagine that a satisfactory way of drying this product will be to spread the chopped peel on trays, and to stack them in the usual air circulation drying chamber fitted with steam-pipe heater and adjustable ventilator. Adjustment of humidity at different stages of the drying operation will have to be determined experimentally. I believe that it used to be common practice, and may be now carried out to some extent, to cut the peel into spiral forms and suspend them in a room for slow drying under ordinary atmospheric conditions. This method should produce the best product as regards flavour, owing to the minimum loss of flavouring oils and any chemical changes which may be brought about in their constitution by more elevated temperatures.

It would seem, therefore, from this that in artificial drying the whole aim should be to carry out the operation at the lowest possible temperature and minimum contact with air. Vacuum drying should, therefore, prove ideal.

Maraschino Cherries

1,657. *Would you be so kind as to send me particulars of the complete process of preparing Maraschino cherries?* (England.)

There are several methods in use for preparation of Maraschino cherries. Here is one.

Syrup No. 1.—Dissolve 30 lb. sugar in 12 gal. boiling water and filter. Stir in 60 lb. glucose. Colour the syrup pink.

Syrup No. 2.—Dissolve 30 lb. sugar in 4 gal. boiling water and filter. Stir in 60 lb. glucose.

Syruping.—Arrange a series of glazed earthenware pans of about 5-gal. capacity. Pour $2\frac{1}{2}$ gal. cold syrup No. 1 into each pot. Place 20 lb. cooked, pitted, and drained cherries in each. Stand for 24 hours. Transfer syrup and cherries to shallow 20-gal. steam pan. Boil gently for two minutes with 30-lb. steam pressure. Cut off steam and add 1 gal. cold syrup No. 2 and stir well.

Return cherries and syrup to pots. Stand for 24 hours. Repeat these operations with syrup No. 2. After a total of three such treatments, allow cherries to drain overnight.

Fill the cherries into bottles of 30 fl. oz. capacity, taking 140 large cherries per bottle. Add 2 fl. oz. spirits of wine and 3 drops essence of almond to each bottle.

Pour the syrup from the cherries into steam pan and bring to boil. Skim and filter bright. Fill up bottles with syrup.

After capping and shaking, sterilise in water bath by raising temperature to 160° F. in one hour and to 180° F. in another hour.

Strawberries in SO_2

1,658. *We put a quantity of strawberries on the stalk in SO_2. We are trying to find an outlet for this, but we have been unable to eliminate the sulphur flavour. Is there any neutralising agent which we could use, and how is the flavour counteracted in jam manufacture?* (England.)

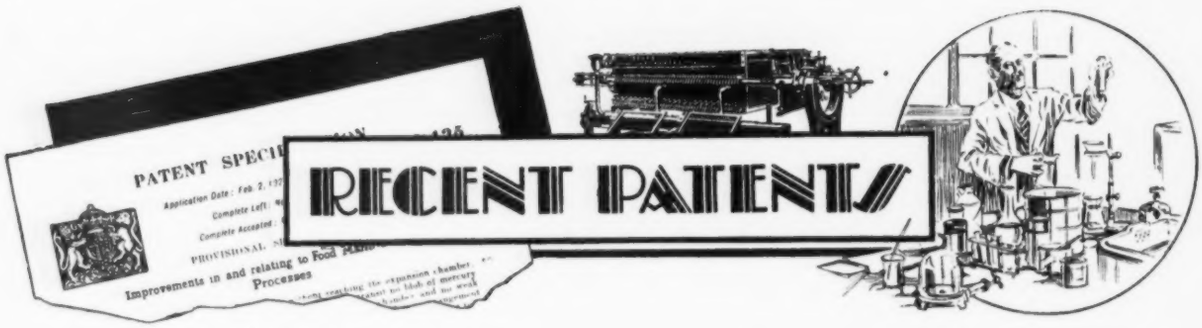
The preservation of strawberries on stalk in SO_2 should always be avoided if possible, as a certain amount of undesirable flavour and colour is extracted from the stalks. Also at the time of sieving, the well-soaked leaves, etc., may be broken up and brushed through the sieve with the pulp. For this reason sieving should be done as soon as possible after preserving.

In order to remove the sulphur flavour from the fruit we suggest that your best plan would be to sieve, and then boil the pulp vigorously for about ten minutes. Water should be added to allow for evaporation. When most of the SO_2 has been removed the colour will change to a shade approaching that of the original strawberries. All the SO_2 cannot be removed in this way, but sufficient should be driven off to eliminate the sulphur flavour. This is also the way in which SO_2 is removed from sulphited pulps in the manufacture of jam, where again a residue of SO_2 remains.

We see no reason why you should not use pulp, after sieving, for jam manufacture, provided that it is mixed with a large proportion of other pulp put down after plugging properly.

It has occurred to us that you may intend to can the purée after removing the SO_2, but would not advise this, on account of the residual SO_2. We should anticipate excessive corrosion.

(Enquiries 1,659-1,672 are unavoidably held over to the next issue.)



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Latest Patent Applications

19089. HILL, E. B.: Food preparations. June 28.

19419. POULTNEY, S. V.: Manufacture of extracts, etc., of coffee, etc. July 2.

19484. LUTHJE, H.: Preparation of an adjunct in baking from starch. July 2. (Germany, July 4, 1933.)

19611. LUTHJE, H.: Process for a depolymerised starch to be used as adjunct in baking. July 3. (Germany, July 6, 1933.)

19858. SMITH, G. A.: Apparatus for removing rind from bacon, etc. July 6.

20268. BECK, A.: Refining chocolate masses, etc. July 10. (Germany, January 19.)

20500. BECK, A.: Refining of chocolate masses, etc. July 12.

20670. O'CALLAGHAN, M. A.: Preservation of foods and beverages. July 14.

20985. BEECH'S CHOCOLATES, LTD., and COLLINSON, E. W.: Sweetmeats. July 18.

21039. SMITH, H. H.: Foodstuffs. July 18.

21080. MUNRO, H.: Device for cutting vegetables. July 19.

21317. AMERICAN MACHINE AND FOUNDRY CO.: Bread-slicing machines. July 20.

21394. HECKERMANN, H.: Preserving and storing fruit, vegetables, etc. July 21.

21420. MARFURT, A. H.: Food products. July 21.

Complete Specifications Accepted

412,533. OMSTED, K.: Method of and means for sterilizing and subsequently cooling food in closed containers.

412,618. SHORT MILLING CO., J. R.: Method of bleaching flour.

413,220. FERNHOLZ, E.: Production of carbonated beverages.

413,285. ENDOWMENT FOUNDATION: Egg powders. (February 11, 1932.)

413,322. ERNOTTE, M.: Method of using the by-products from the carbonating of saccharine juices.

413,343. SWIFT AND CO.: Processes of improving shortening, and the improved shortening resulting therefrom.

413,488. NEALE, H. A.: Preparation of tablets of coffee or mixtures containing coffee.

413,816. DAUS, H.: Manufacture of chocolate.

413,923. CLAYTON, B.: Process of treating vegetable oils and product obtained thereby.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per group volume, or in bound volumes price 2s. each.

408,780. **Preserving liquids, artificial cream.** REEVES, G. N., and VITACREAM, LTD., 48, Mark Lane, London.

In cooling down after heating liquids which contain substances which undergo a physical change of state in the cooling, the liquid is cooled to a temperature below that at which the change of state occurs, the cooling is interrupted to allow the mixture to assume its new physical state at an average temperature below that at which the change occurs, and the cooling to the desired low temperature is then completed. The first cooling may be to a point considerably below that at which the change occurs, and may be to or near the final low temperature. The cooling is carried out by passing the liquid in a stream or streams through channels or over surfaces in the cooling apparatus. The process is applied particularly to processes for preserving liquids containing fats, including cream and other milk products of relatively high fat content, or other liquids containing proteins, the solidification of the fat causing a rise in temperature whilst cooling down after pasteurising or other heat treatment. In the treatment of the artificial cream prepared by heat treatment—*e.g.*, at 134° to 194° F.—of a mixture of 40 per cent. fat and 60 per cent. milk and an emulsifying agent—*e.g.*, egg yolk—the mixture is passed through a heat exchanger and rapidly cooled to a temperature considerably below that at which the fat solidifies—*e.g.*, 38° F.—and then allowed to stand for, say, twenty minutes, during which time the temperature will rise to about 55° F. The mixture is again led to the heat exchanger and cooled—*e.g.*, to 34° F.—and then led to a container and kept in cold storage. The process may be made continuous by leading the liquid in succession through a heat exchanger, a holder, and the same or another heat exchanger.

409,727. **High-speed drying of fruit and vegetable pulp.** SARDIK, INC. (Convention date, U.S.A., December 23, 1931.)

Raw pulp is fed on to the outer surface of an internally steam-heated, stainless steel rotating drum via a distributing roll which spreads the mass in a highly dispersed form. The particles are thus intensively exposed to the heat and a special removal device consolidates them into a coherent mass after drying. The final physical structure of the mass facilitates reincorporation of liquid for edible use. The drying periods which are said to be practicable range from a few seconds at 123° C. (75 lb. steam pressure) to about one minute at 90° C. Apple pulp requires 18 seconds' exposure at 104° C., while tomato pulp is concentrated in 28 seconds at the same temperature. Figures cited for banana pulp are 20 seconds at 103° C. or 3 seconds at 120° C. The apparatus ensures completely uniform heating at a speed which rules out risk of destruction of natural juices and essences.

409,750. **Treatment of coffee beans.** W. V. GILBERT, 1, Parklands, Surbiton, Surrey.

A modification of Specification 408,613 is now put forward in that agitation with an aldehyde solution with a view to improving "hard" coffee beans, prior to roasting, is replaced by exposure to an atomised spray of the aldehyde. Whereas the original process imparted an unpleasant flavour and demanded very careful drying, the spray treatment does away with the

(*Continued on page* 331.)